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The development of a weather-typing system for extended-range forecasting

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THE DEVELOPMENT OF A WEATHER-TYPING SYSTEM FOR EXTENDED-RANGE FORECASTING

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THE DEVELOPMENT OF A WEATHER-TYPING SYSTEM

FOR EXTENDED-RANGE FORECASTING

by

Samuel W. Selfridge Jr.,

Norman M. Stevenson

and

Edgar K. Wood

This work is accepted as fulfilling

the thesis requirements for the degree of

MASTER OF SCIENCE
IN
METEOROLOGY

from the

United States Naval Postgraduate School

[illegible]

[illegible] types is [illegible] predicting the evolution of basic types, and also for determining the relationships between [illegible] and surface [illegible].

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Introduction

In co[illegible] typing as a method of extended-range [illegible], [illegible] most significant point one first [illegible] conspicuous lack of recent research in this [illegible] [illegible] literature reflects little advance [illegible] in spite of the progress being made in other fields such as statistical and numerical methods. This point is somewhat remarkable, for weather typing has long been recognized as being sound in principle and logical in concept among forecasting methods. When one considers the inherent shortcomings of weather typing, however, an explanation of the absence of recent progress is evident.

Namias [5], in his discussion of the advantages and disadvantages of the weather-type method, states that not only must the weather type be based on a reasonably objective system that will avoid as much variation in classification as possible, but that the weakest phase of the entire concept is the inability to predict the coming type, or the subsequent evolution of weather systems. The works of Elliott [2] and Baur [1] are well-known as comprehensive and indefatigable studies of the weather-typing systems and, even though correlation coefficients have been established within limited areas, neither existing system possesses a reliable scheme for predicting future changes.

The weather-typing method, then, is of little aid to the forecaster unless it includes a dependable plan whereby,

given a certain type, one can reasonably forecast changes of the type within a certain period of time, and hence, be able to predict changes of surface weather phenomena that may be associated with changes of type. It is believed that such a method can be devised and it is with this purpose in mind that the authors undertook this project.

The first step involved the investigation of the excellent groundwork established by Holland and Mills, whose work "A Hemispheric Study of Weather Types" [4], introduces an essential concept to a sound weather-typing method, i.e., typing on a hemispheric basis. This is considered important since, in order to formulate a scheme of forecasting the evolution of weather patterns, data must be analyzed on a hemispheric rather than a regional, limited scale such as is the basis for earlier methods. Interaction of disturbances about the closed hemispheric system is considered to be significant and should not be disregarded.

After thorough study of the Holland and Mills paper (hereinafter referred to as H/M), their basic concept of utilizing the 500-mb flow as basis for the classification of hemispheric types is accepted in its entirety.

The choice of using the 500-mb level is largely a compromise; however, its advantages appear to warrant its use rather than the more direct environment of surface patterns: first, the larger scale features of the 500-mb flow are more easily recognized than surface patterns; secondly, these upper-air features change more slowly and more distinctly, and it

is possible to delineate with less subjectivity the life cycle of a given pattern at the upper level.

In spite of the decision to type at 500-mb, there is immediately introduced the need to correlate surface weather phenomena with a given upper-air pattern. It is emphasized that a workable weather-typing method must be able to predict changes in surface weather as an end product. Thus, the use of an intermediate level, such as the 500-mb level, presupposes the ability of the system to forecast surface evolutions as they may be directly related to upper-air changes. This problem will be discussed separately in Chapter 3.

Random application of the H/M system to observed data revealed certain areas in which it was felt improvement could be made. It was found that the subjectivity of the system might be reduced by restricting the geographical extent of the "zone", or sector, to a smaller area. A 90-degree zone as employed by H/M encompasses one-quarter of the hemispheric flow and within this area it is questionable whether their defined types can adequately describe the various combinations of large-scale features that can occur within so great an area. Furthermore, in several cases it was observed that the pattern of surface systems varied considerably from the mean track described during the existence of the same 500-mb type. This variance could be lessened, it is believed, by the same modification, i.e., reducing the defined area of a type. Therefore, in view of the foregoing, it will be noted that the typing system as proposed herein has modified the H/M

plan by dividing the hemisphere into six 60-degree sectors in lieu of four 90-degree zones. Further, the designation of these geographical areas as sectors vice "zones" was adopted by the authors as being more appropriate and to avoid conflict with the word "zonal" which frequently characterizes the flow of a sector.

From this point of departure it has been attempted to develop a weather-typing system in keeping with the previously discussed principles and prerequisites, among which the following have been emphasized:

1) the classification of types has been designed to be simple and objective;

2) contingency tables based on a calendar of types for several years of data have been prepared in an attempt to devise a plan for compiling certain correlations necessary to be useful as an extended-range forecasting method; and

3) a scheme for determining the uniqueness of surface patterns as related to given upper-air types has been suggested.

CHAPTER I

DESCRIPTION OF THE 500-mb TYPING SYSTEM

Sectors

The Northern Hemisphere has been divided into six 60-degree sectors as illustrated in figure 1. The longitudinal extent of the sector is such that large-scale features can easily be identified. The division of the sectors is also geographically logical.

Sector	Longitudinal Limits	Geographical Extent
I	120E-180E	Western Pacific Ocean
II	180W-120W	Eastern Pacific Ocean
III	120W-60W	North American Continent
IV	60W-0	Atlantic Ocean
V	0-60E	Europe & Western Asia
VI	60E-120E	Eastern Asia

Description of Types

The fundamental types as defined herein are identified by large-scale features of the instantaneous 500-mb flow, such as the position of the axis of zonal flow, major troughs, and ridges. It will be noted that the simple types are applicable to any sector, some complex types are unique to certain sectors only.

Considerable study was devoted to the various patterns that were found to occur in each sector. As a preliminary step to determining a distinct set of types, the sector was classified as either zonal, meridional, or blocking. The

pattern of large-scale features of the predominant band of westerly flow and a grid position of closed lows and highs were then coded for machine processing. Similar patterns were sorted automatically and compared. From this grouping average distinct types were developed. The following definitions have been derived by the authors as a basis for the proposed typing system:

1. A <u>weather type</u> is defined as a unique pattern of the 500-mb flow occurring at a given time within a specified sector of the hemisphere. It is emphasized that this is a preliminary definition, for it does not include the prerequisite of describing the uniqueness of surface weather, such as a particular mean track of cyclones and/or anticyclones. Thus, the following types are subject to careful evaluation and revision by upper-air/surface correlation. (Refer to Chapter 3).

2. The <u>life cycle</u> of a type is defined as the duration of a specific 500-mb pattern during which the surface pattern does not deviate from some defined limit. This cycle will vary and is dependent again upon the ability of close study to reveal reasonable upper-air/surface correlation.

3. A <u>zonal type</u> is defined as a pattern of 500-mb flow which is primarily zonal across the sector. The latitudinal belt of westerlies must be generally continuous and not split. The absence of major troughs or ridges in the flow is implied.

4. A <u>meridional type</u> is defined as neither zonal nor

blocking. Usually, the simple* meridional types exhibit fundamental patterns of troughs and/or ridges; however, several of the complex types* common to certain sectors do not fit a simple wave pattern.

5. A blocking type is defined in accordance with the types defined in "A Study of the Jet Stream Conditions in the Northern Hemisphere During Winter/Spring" published by the Meteorology Division of the Pan American Airways, Inc., under the sponsorship of the U.S.Naval Weather Research Facility [6,7]. Generally, a sector is classified as blocking if, within the sector, the flow pattern can be associated with one of the defined blocking types for that sector, and if the particular blocking flow has persisted for three or more days.

On the following pages each type is described by an illustration of an actual example of the type. These maps were selected to represent the features of the model type. In addition to the illustration, each zonal and meridional type is further defined in words. Each meridional type is identified by a schematic diagram of the model. Percentage frequency graphs for each zonal and meridional type are displayed to show the overall distribution of each type. Table 1, page 46, is a statistical summary of zonal and meridional types. The distribution of blocks is discussed in Chapter 2. The short letter-number designations of each assigned type are used for reference hereafter.

*A simple type is one containing a single well-defined flow whereas a complex type exhibits split, diverging or converging flow.

A calendar of types is included in Appendix I. The data utilized for the calendar, the development of the basic classification system, and correlation program were selected from portions of the Historical Weather Map Series [8]. A total of 542 days (3,252 sectors) were typed for the months January, February, and March during the years 1952-1957 inclusive.

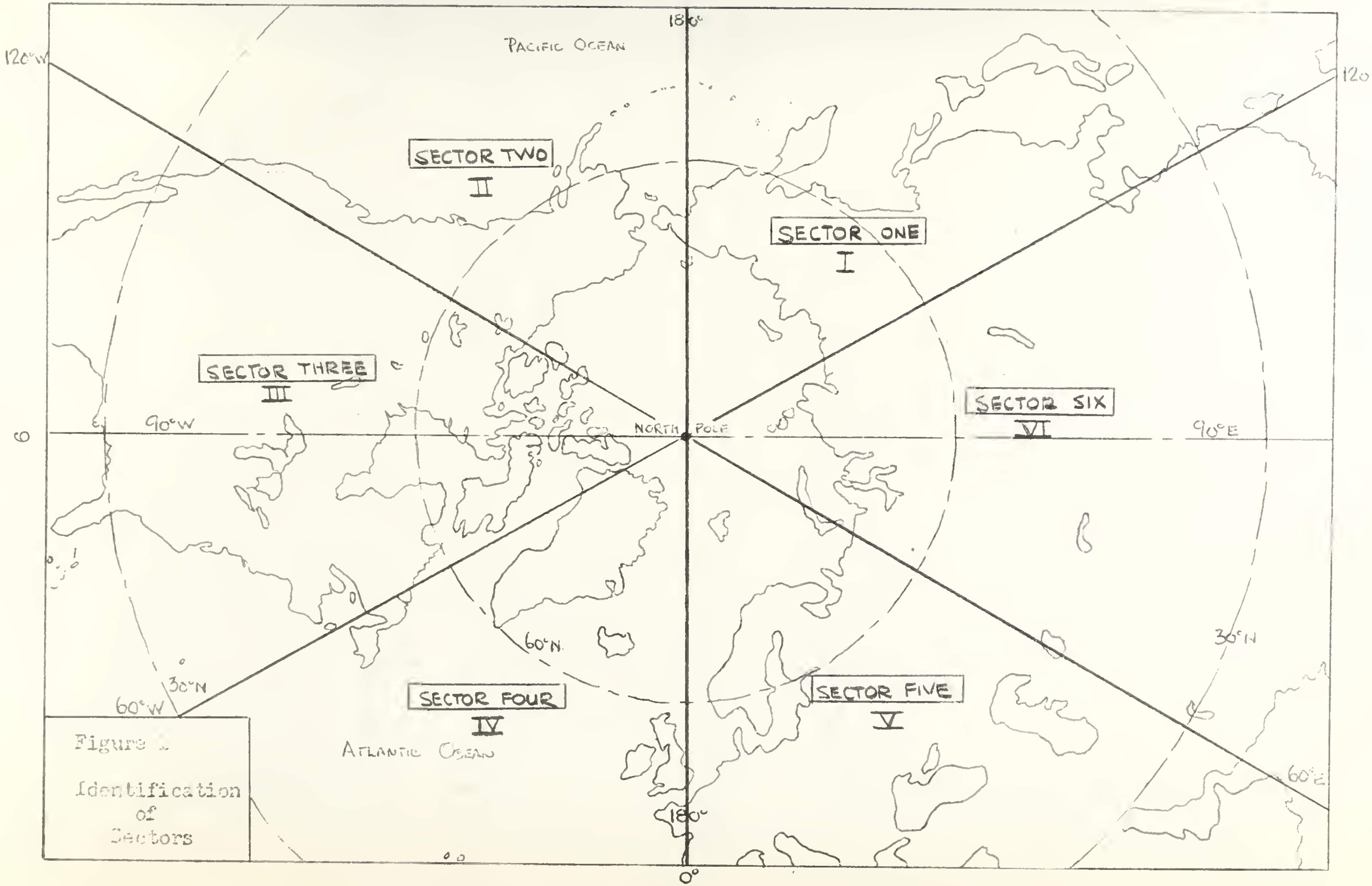
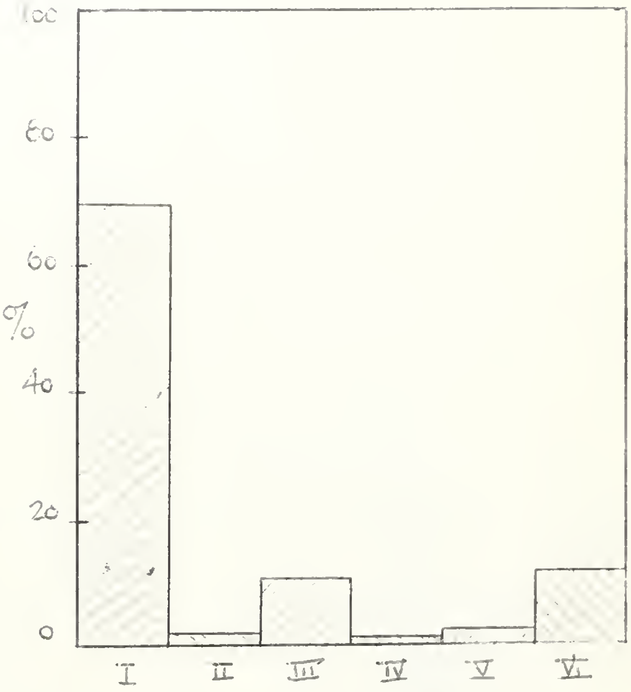


Figure 1
Identification of Sectors

Zonal Type ONE - Z1

Percentage Frequency
Distribution



Definition: This type is defined as a zonal type whose mean axis of flow is found south of 40 degrees latitude.

Frequency: Total number of Z1 types found: 292

a. Predominant sector: I

b. Considering all types, a Z1 type occurs 9% of the time

Note: As an example of the frequency distribution graph above, based on an occurrence of 292 Z1 types, a Z1 type was found to occur in Sector I 68% of the time. Similar interpretation of the remaining graphs is left to the reader.

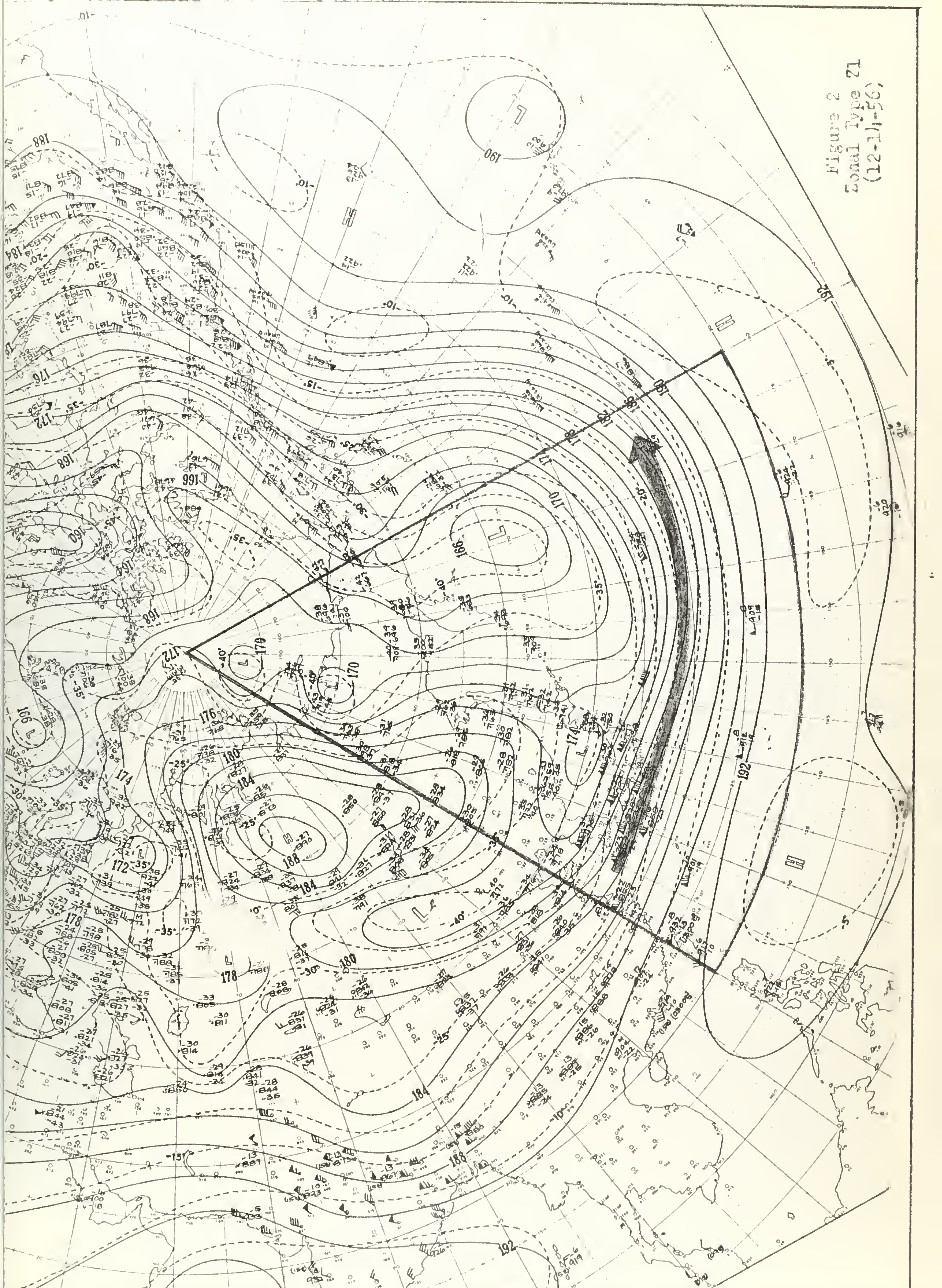
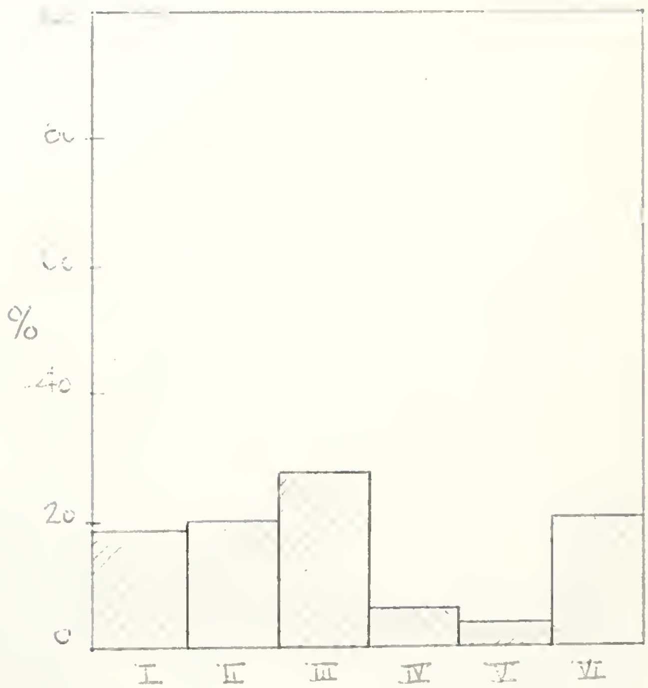


Figure 2
Zonal Type Z1
(12-14-56)

Zonal Type TWO - Z2

Percentage Frequency
Distribution



Definition: This type is defined as a zonal type whose mean axis of flow is found north of 40 degrees latitude.

Frequency: Total number of Z2 types found: 141

a. Predominant sectors: I, II, III, VI

b. Considering all types, a Z2 occurs 4.5% of the time.

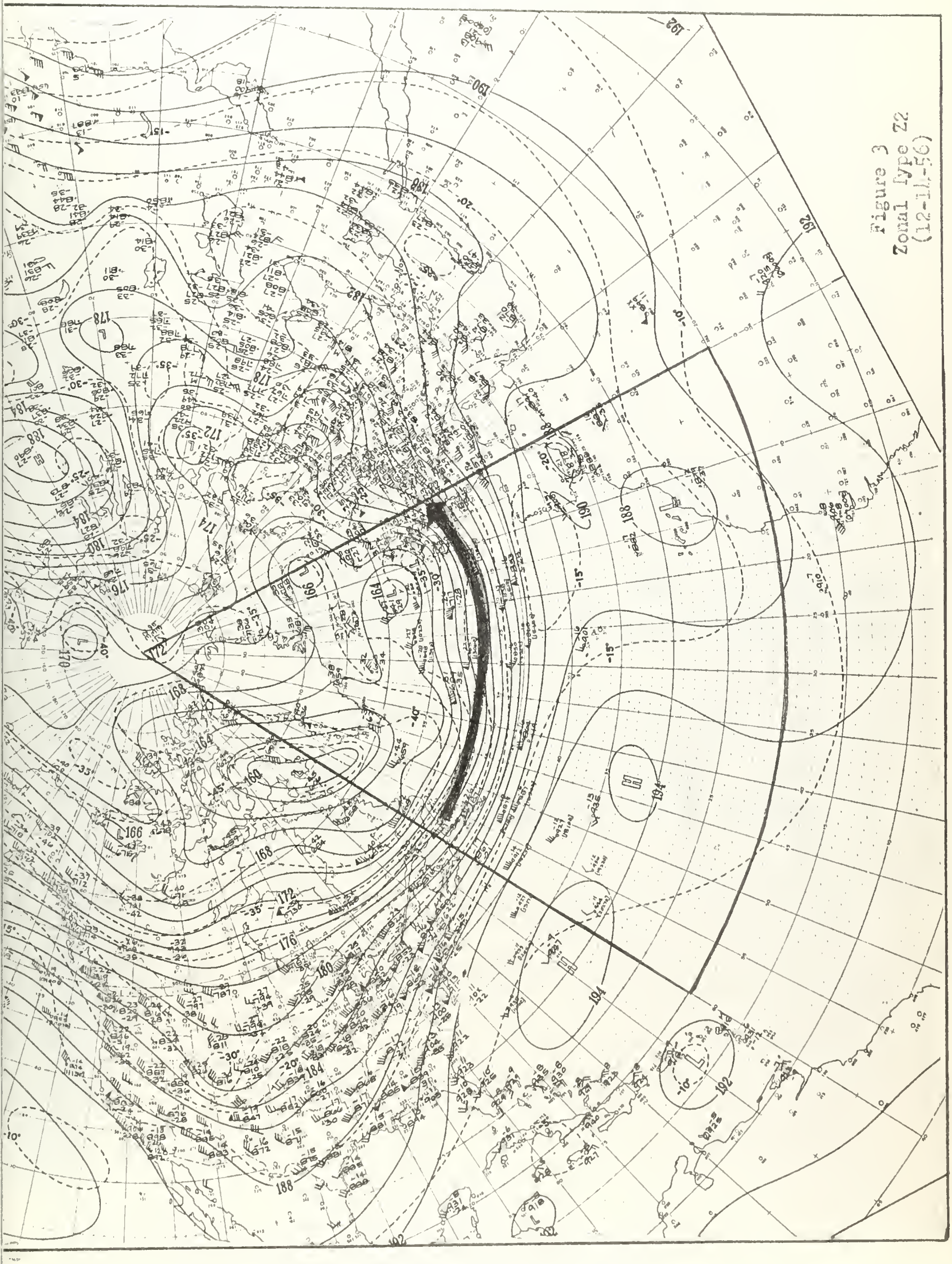
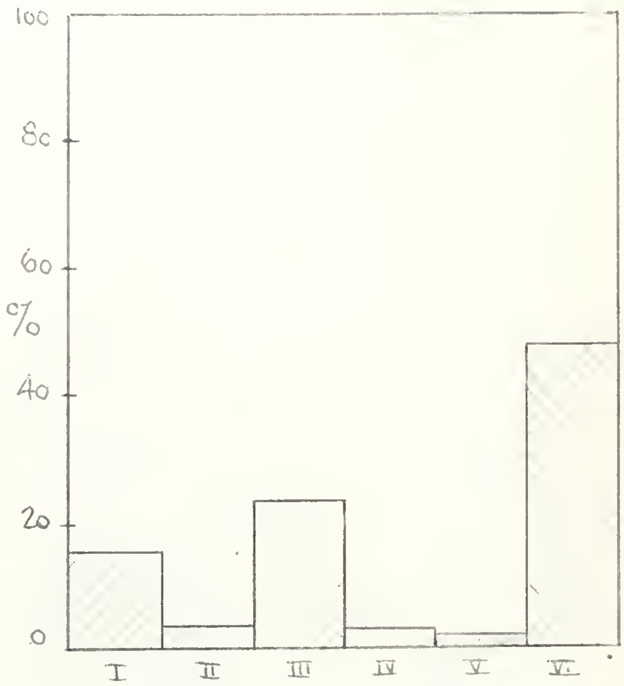


Figure 3
Zonal Type Z2
(12-11-56)

Zonal Type THREE - Z3

Percentage Frequency
Distribution



Definition: This type is defined as a zonal type whose mean axis of flow is found at 40 ± 2.5 degrees latitude.

Frequency: Total number of Z3 types found: 293

a. Predominant sectors: I, III, VI

b. Considering all types, a Z3 occurs 9% of the time.

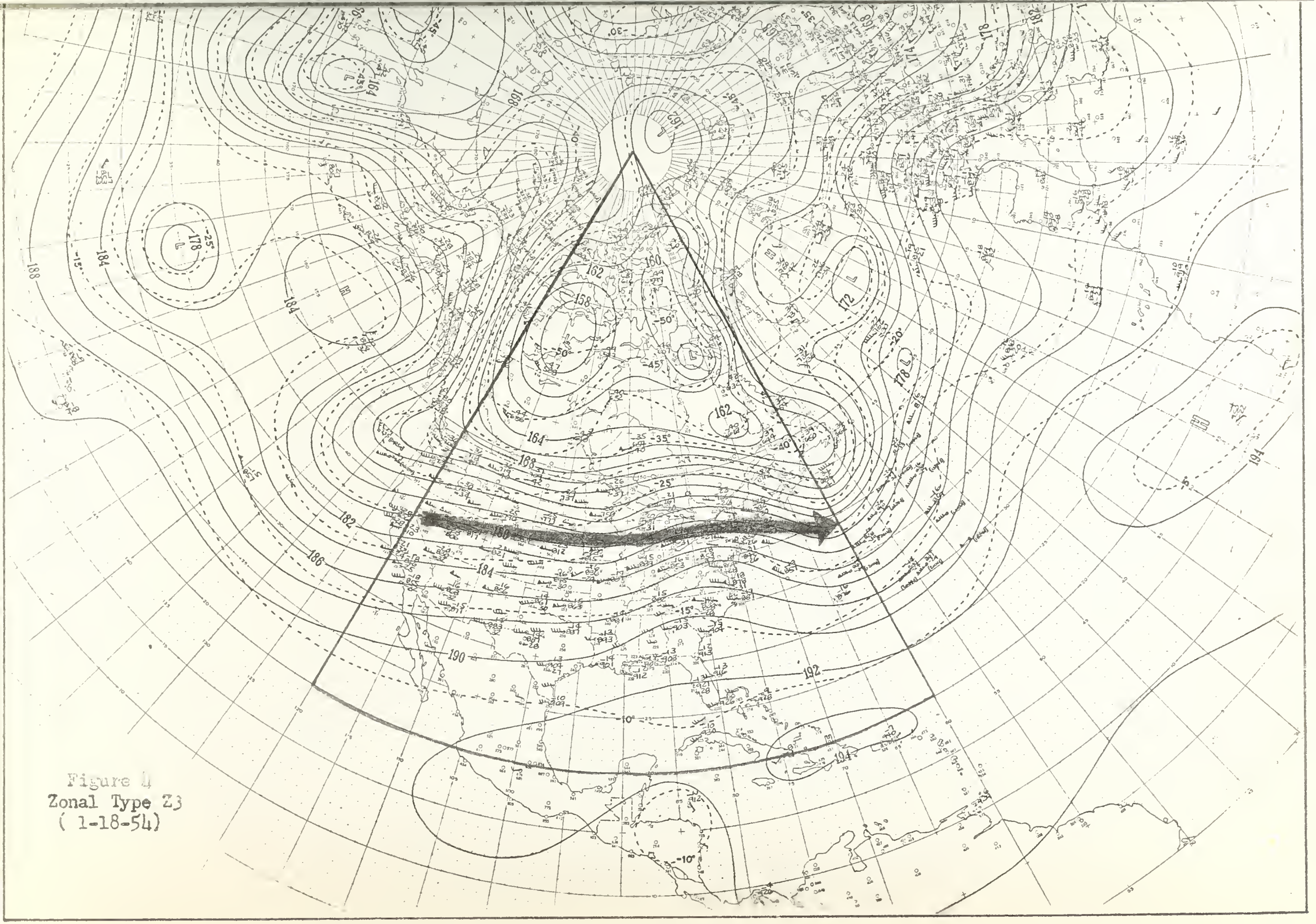
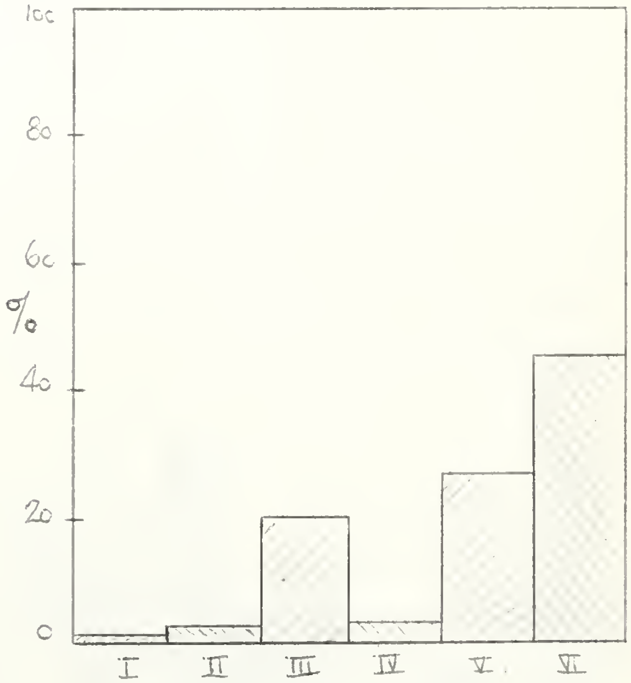


Figure 4
Zonal Type Z3
(1-18-54)

Zonal Type FOUR - Z4

Percentage Frequency Distribution



Definition: This type is defined as primarily a zonal type whose flow is split. This can be considered a complex type in that there exists more than one well-defined flow axis, usually two. One of the flows may be meridional. A Z4 type is found almost exclusively in the continental sectors. Two examples are exhibited.

Frequency: Total number of Z4 types found: 318

a. Predominant sectors: III, V, VI

b. Considering all types, a Z4 type occurs 10% of the time.

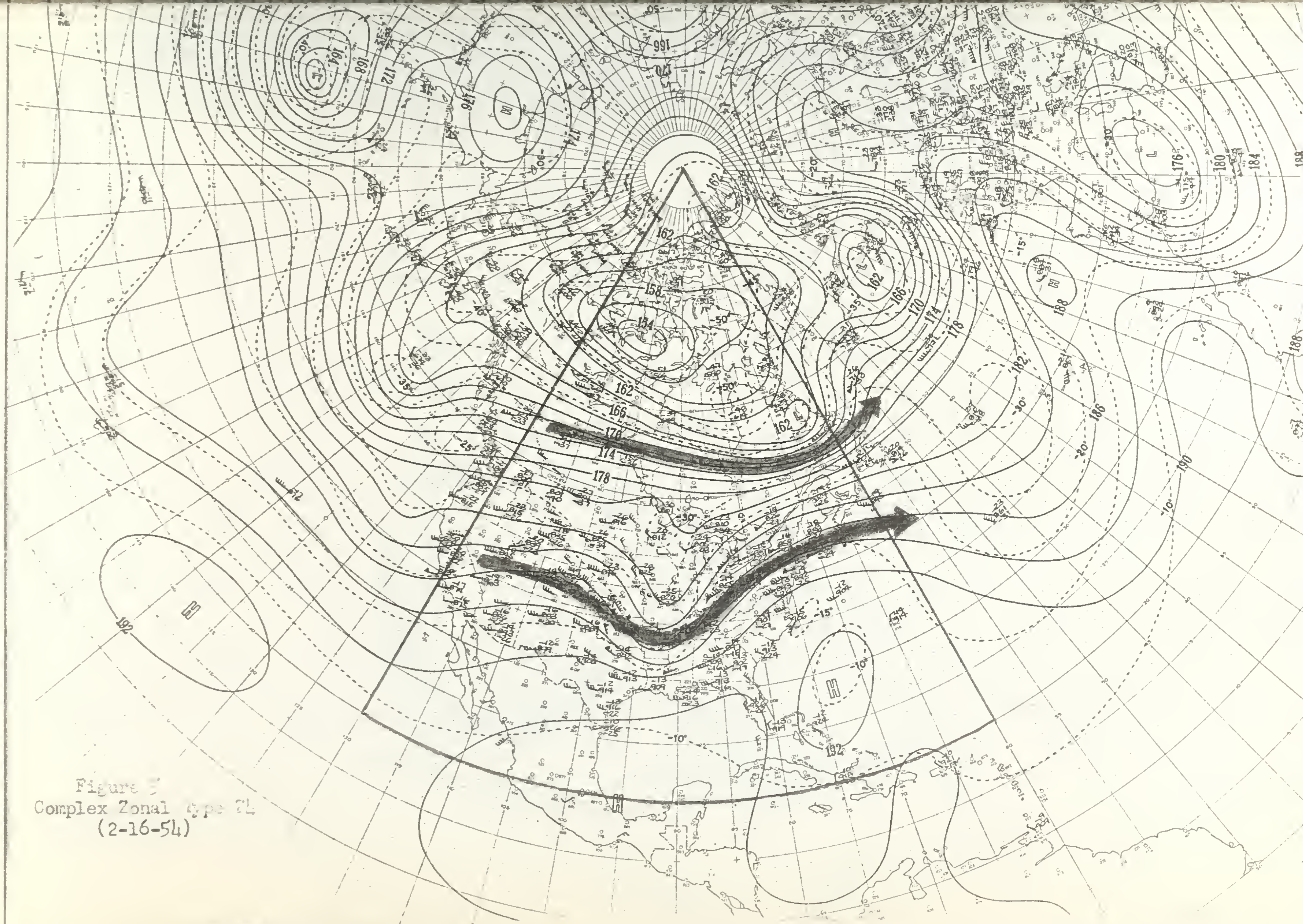


Figure 5
Complex Zonal type TL
(2-16-54)

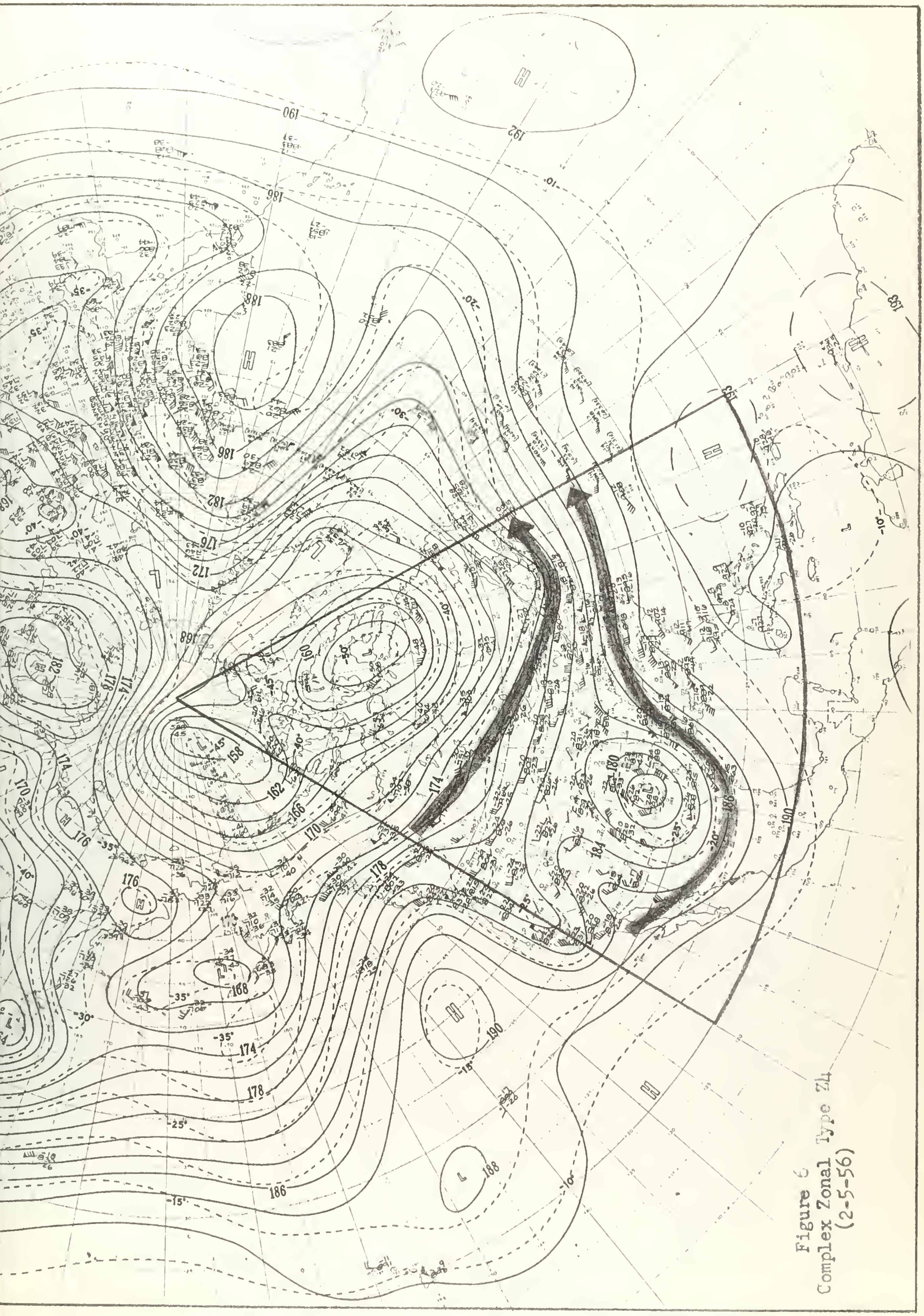
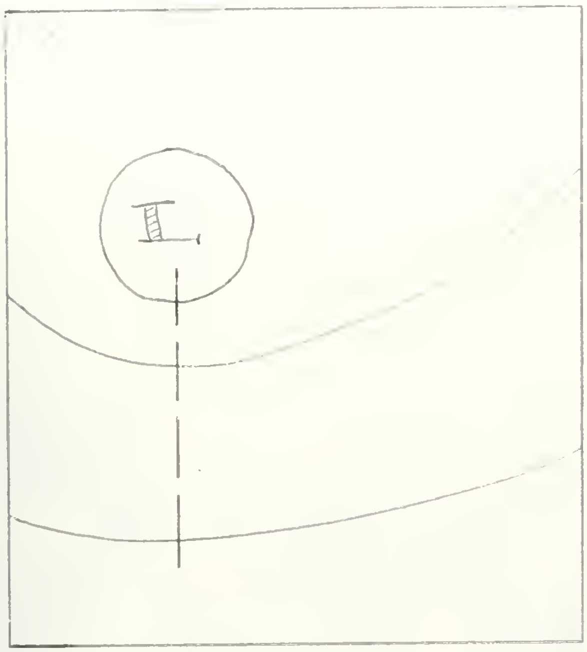
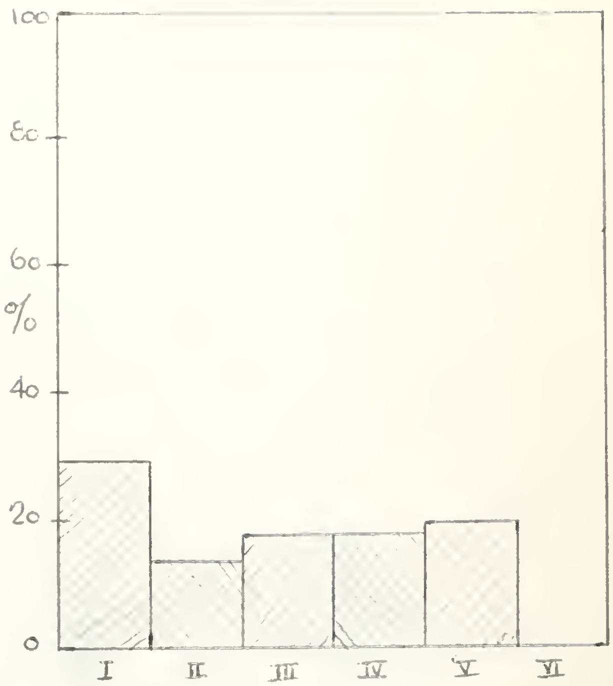


Figure 6
Complex Zonal Type Z4
(2-5-56)

Meridional Type ONE - M1



Schematic Model



Percentage Frequency Distribution

Definition: This type is defined as a meridional type consisting of a long-wave trough along the western region of the sector. The trough need not be sharply defined but must be identified with pronounced cyclonic curvature.

Frequency: Total number of M1 types found: 79

a. Predominant sectors: All sectors except VI

b. Considering all types, an M1 type occurs 2% of the time.

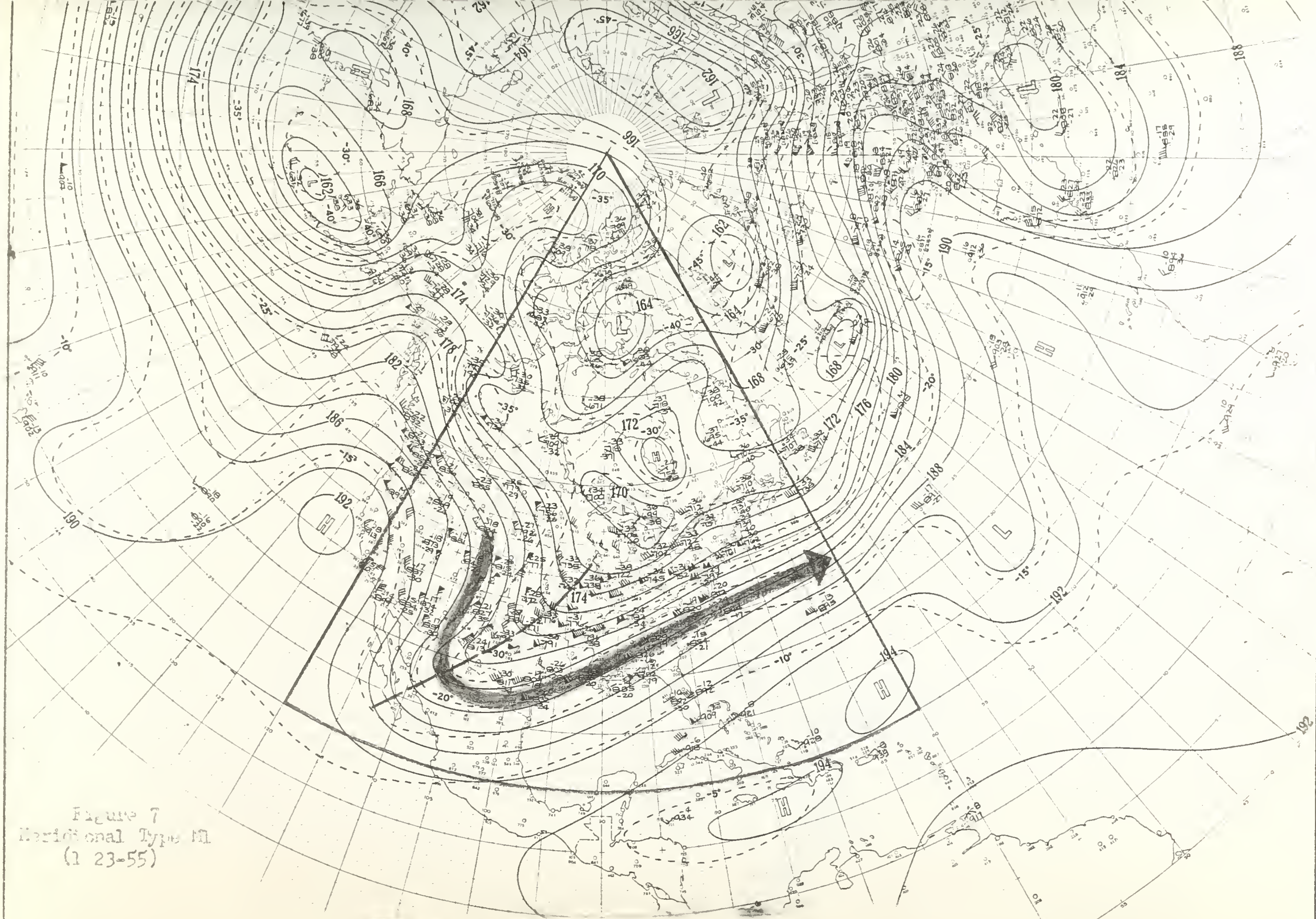
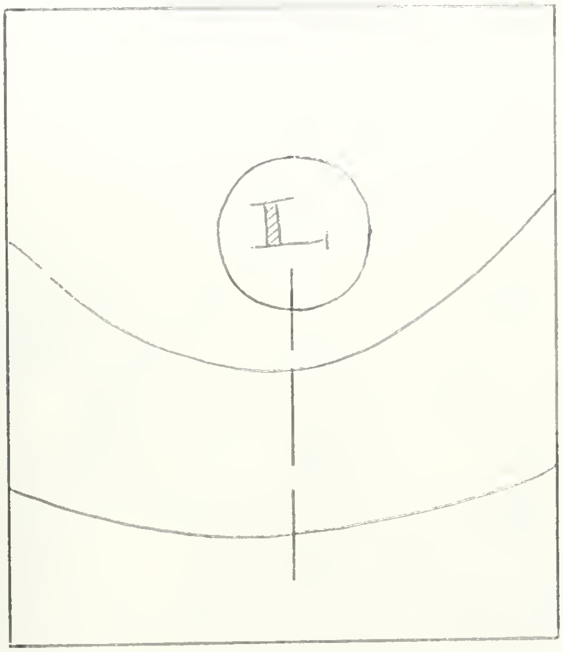
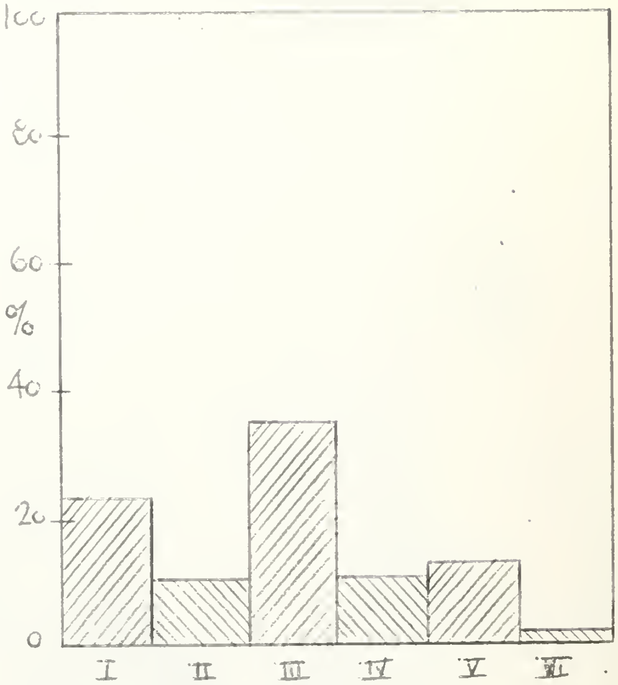


Figure 7
Meridional Type M1
(1 23-55)

Meridional Type TWO - M2



Schematic Model



Percentage Frequency Distribution

Definition: This type is defined as a meridional type consisting of a long-wave trough in the central region of the sector.

Frequency: Total number of M2 types found: 107

a. Predominant sectors: I, III

b. Considering all types, an M2 type occurs 3% of the time.

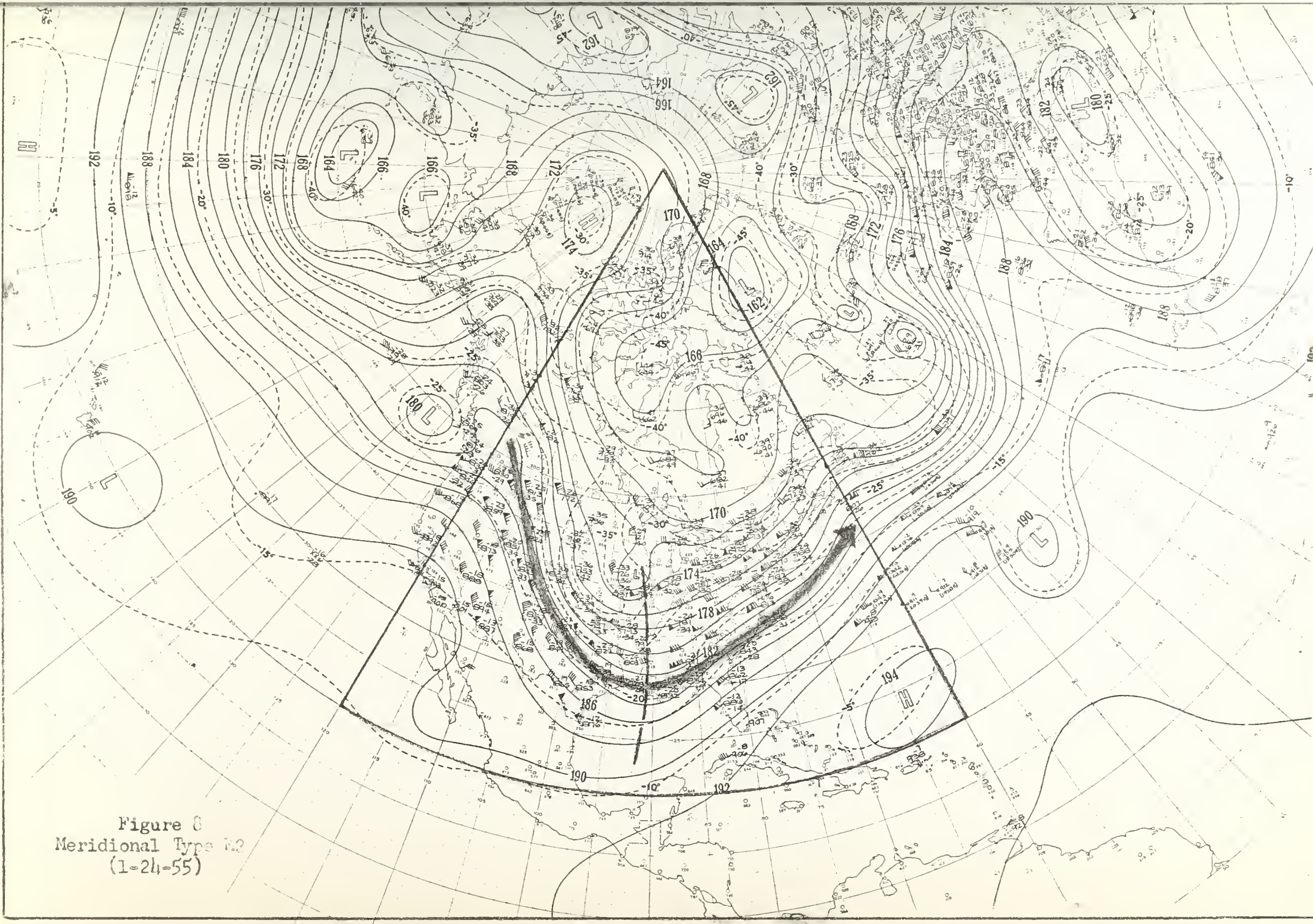
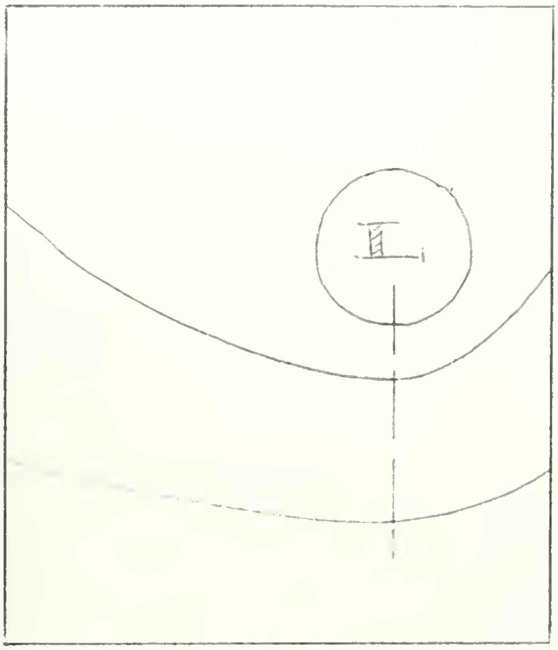
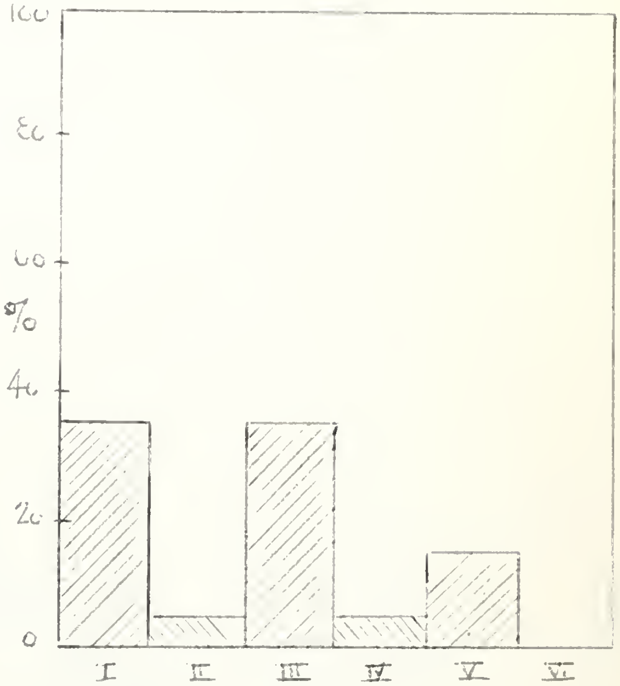


Figure 8
Meridional Type N2
(1-24-55)

Meridional Type THREE - M3



Schematic Model



Percentage Frequency Distribution

Definition: This type is defined as a meridional type consisting of a long-wave trough through the eastern region of the sector.

Frequency; Total number of M3 types found: 83.

a. Predominant sectors: I, III

b. Considering all types, an M3 type occurs 2% of the time.

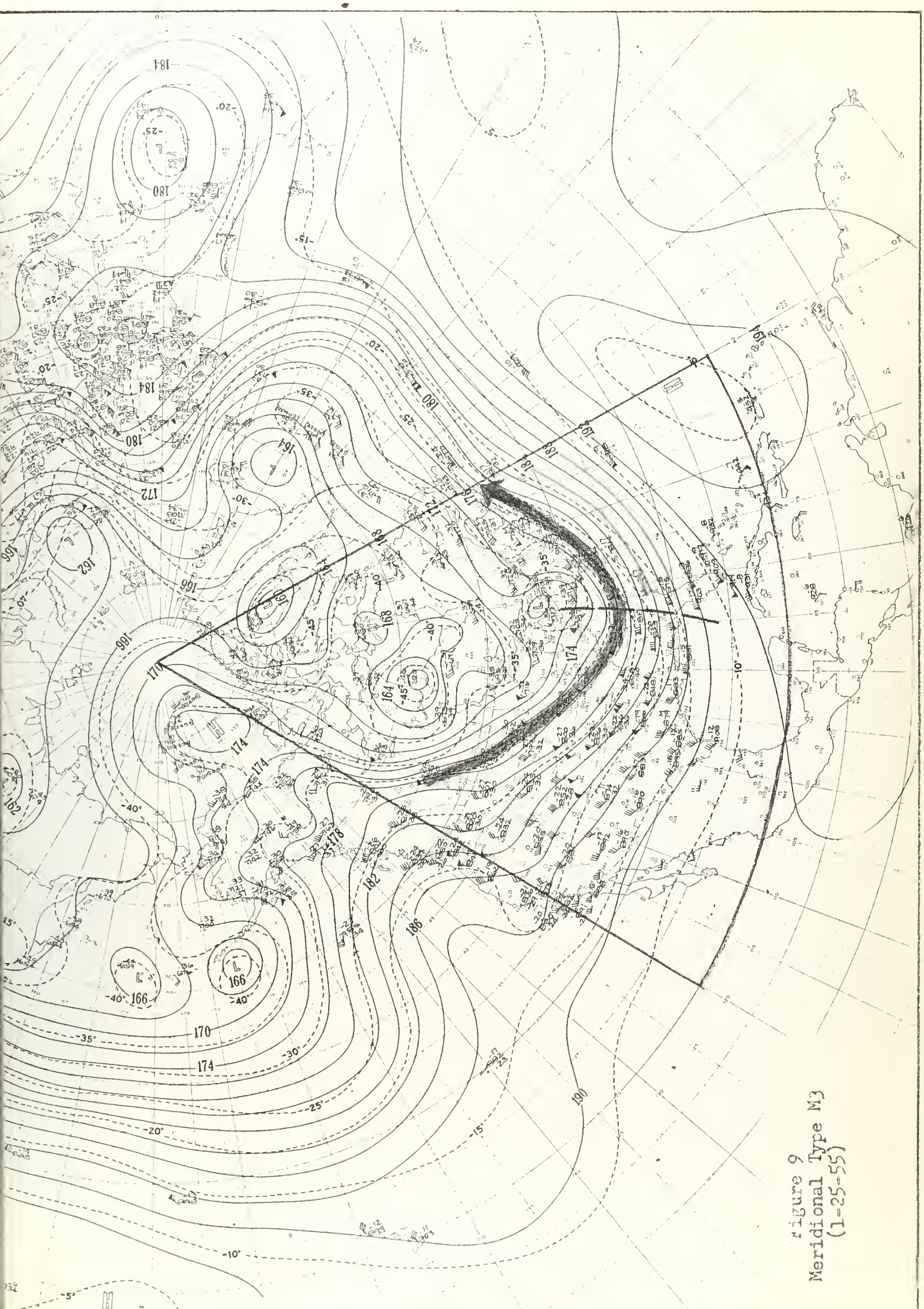
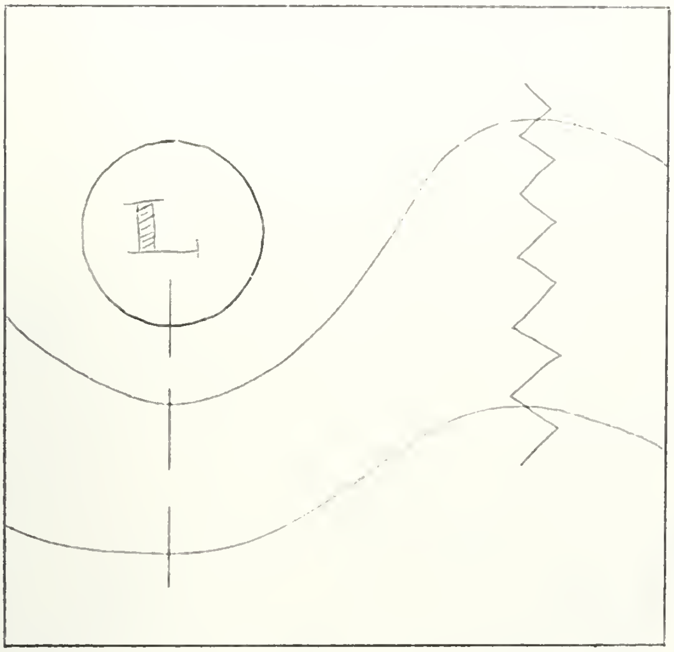
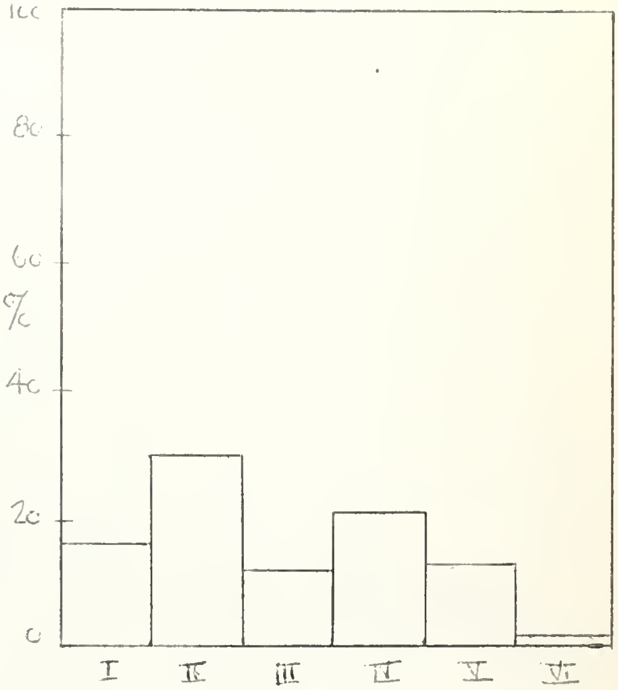


Figure 9
Meridional Type M3
(1-25-55)

Meridional Type FOUR - M4



Schematic Model



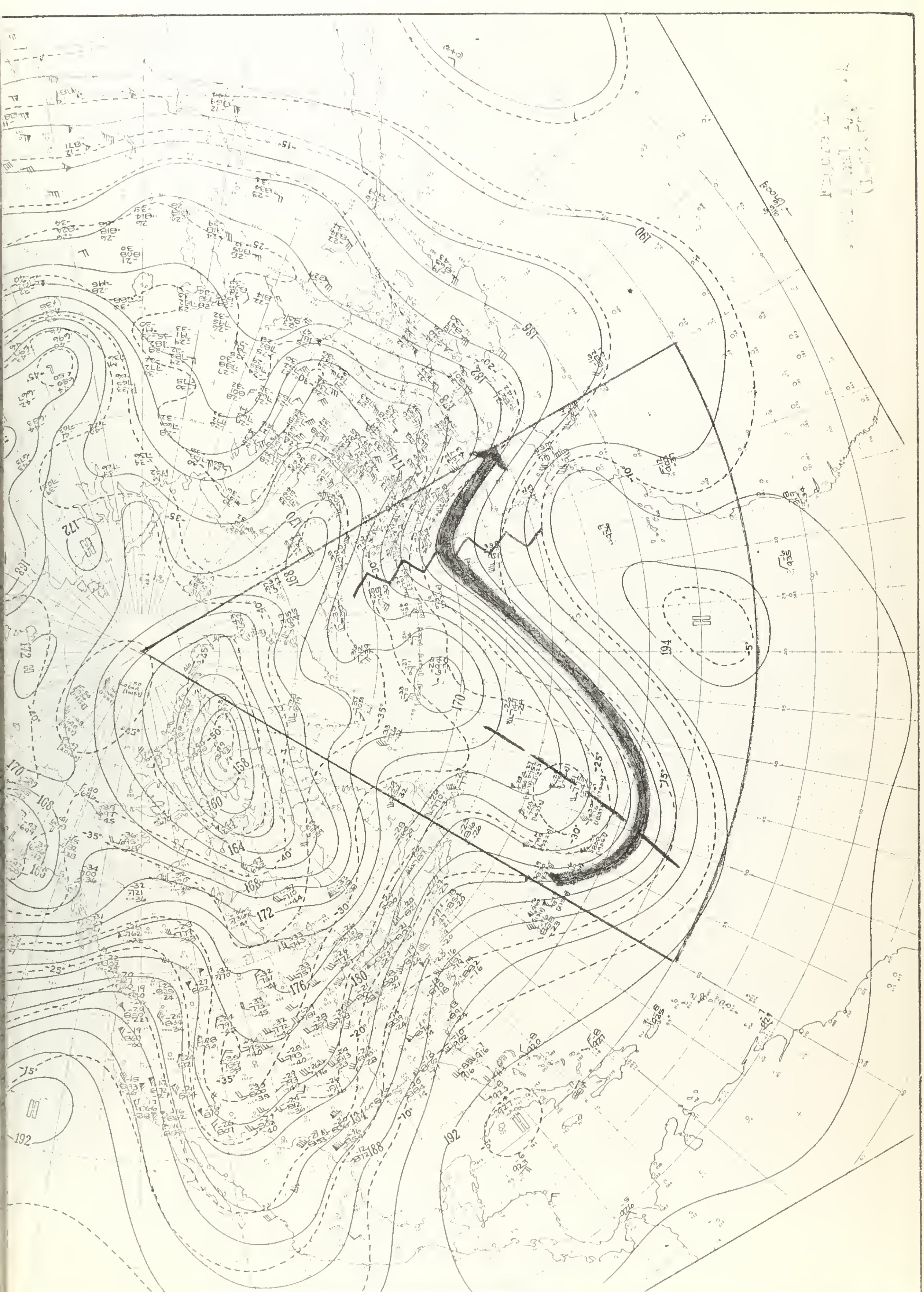
Percentage Frequency Distribution

This type is defined as a meridional type consisting of a long wave in the western area of the sector and major ridging in the eastern part of the sector. This is the most frequent meridional type. Compared to types M1,2, and 3, it follows that the zonal index of the flow is lower for the M4 type.

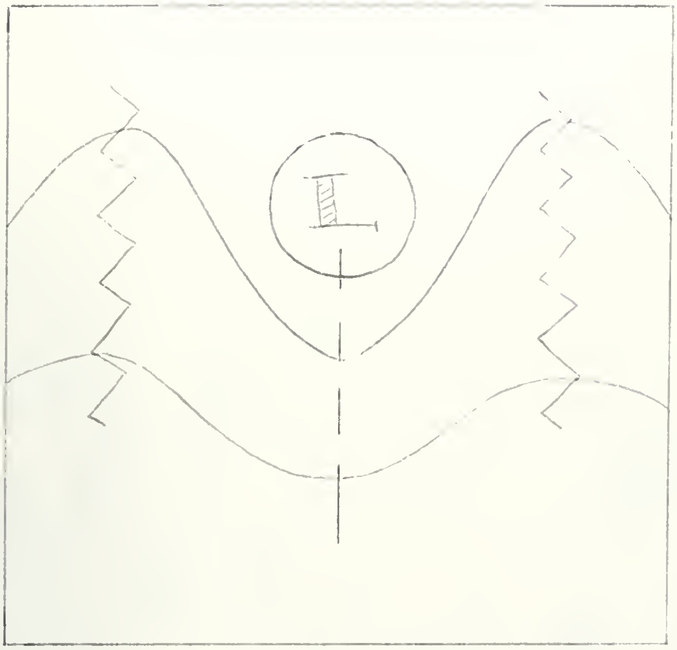
Frequency: Total number of M4 types found: 172

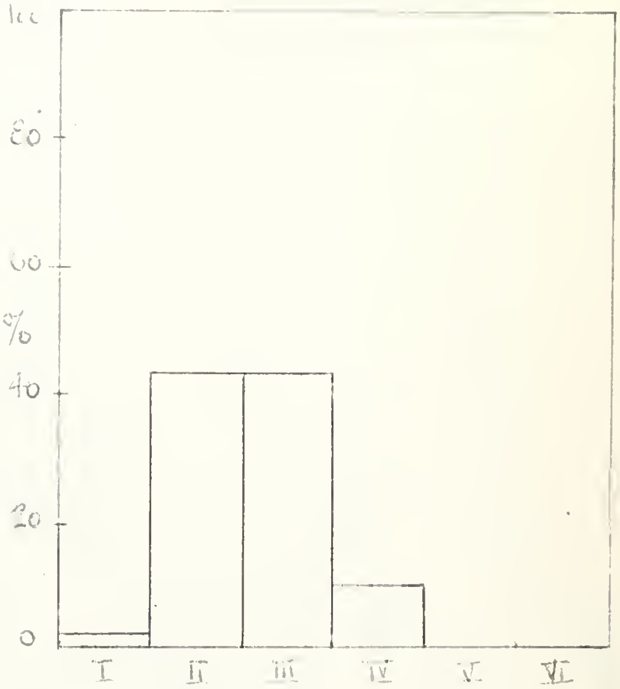
a. Predominant sectors: II, IV

b. Considering all types, an M4 type occurs 5% of the time.



Meridional Type FIVE - M5





Schematic Model

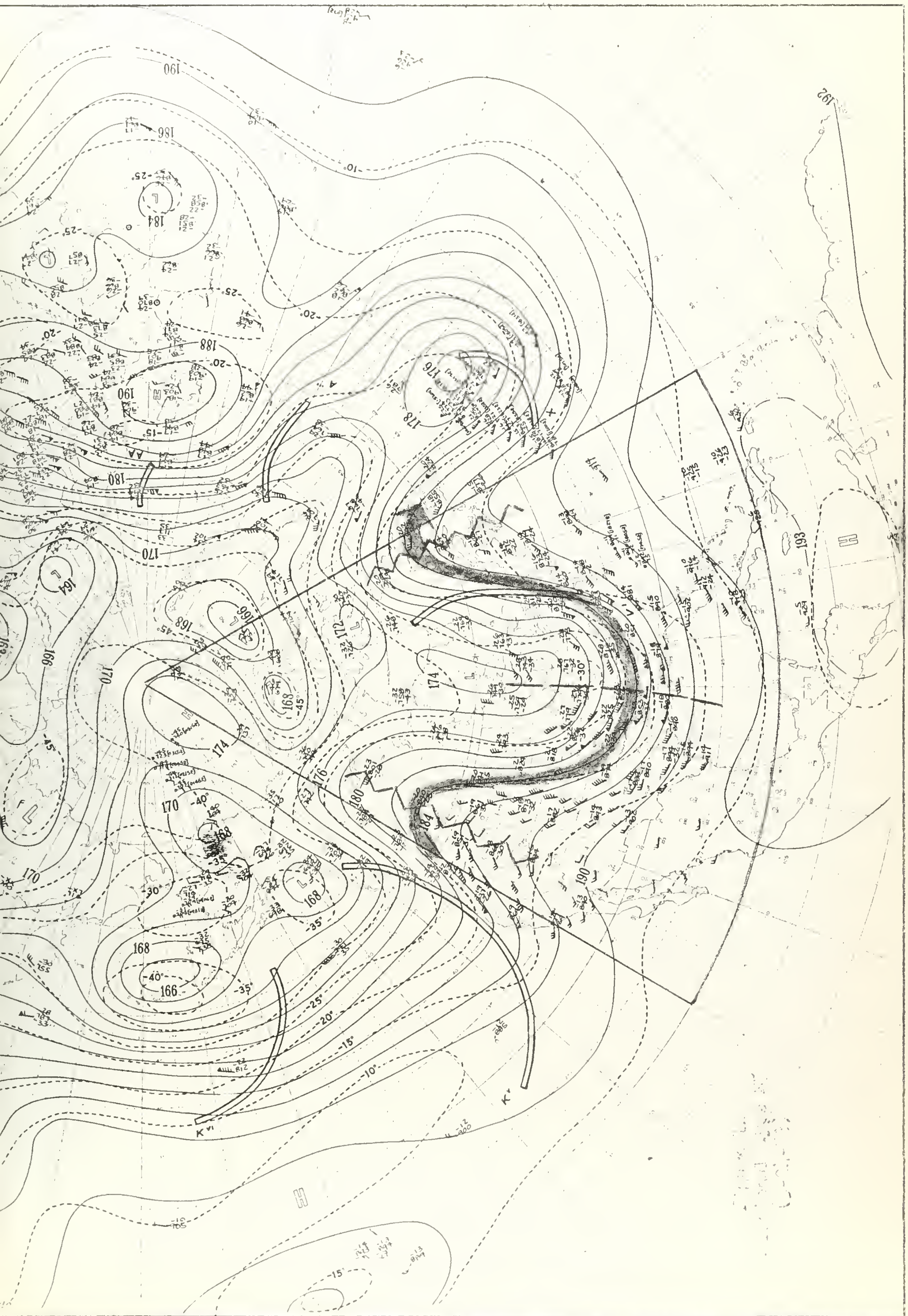
Percentage Frequency Distribution

This type is defined as a meridional type consisting of major troughing in the central region of the sector flanked by major ridges. This type is associated with the highest index of all meridional types and is generally unstable, modifying to another distinct type in less than 48 hours on the average.

Frequency: Total number of M5 types found: 35

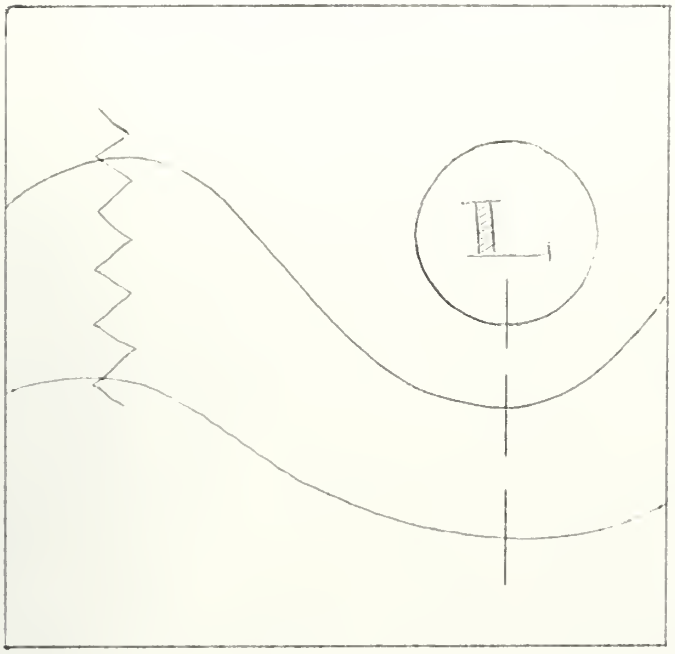
a. Predominant sectors: II, III

b. Considering all types, an M5 type occurs 1% of the time.

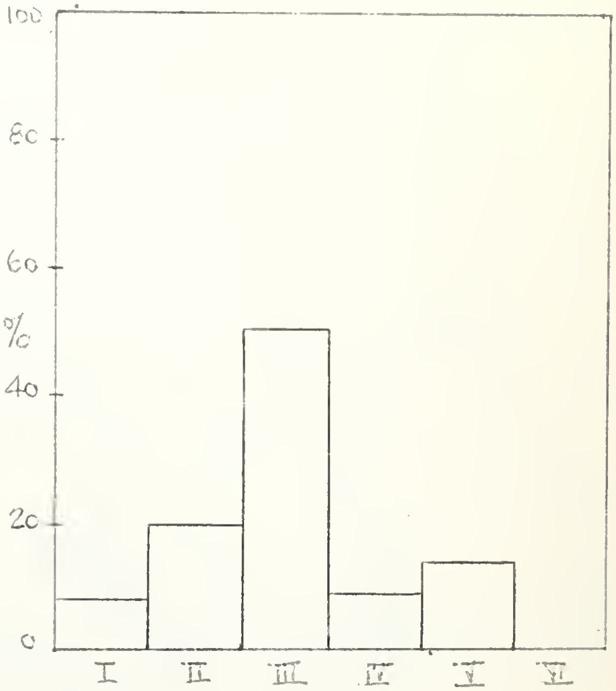


174
176
180
184
168
170
166
172
164
190
-45°
-40°
-35°
-30°
-25°
-20°
-15°
-10°
H
L
K'

Meridional Type Six - M6



Schematic Model



Percentage Frequency Distribution

This type is defined as a meridional type consisting of a major ridge in the western region of the sector and a long-wave trough in the eastern portion. This type occurs about as frequently as the M4 type and in the same sectors. Compared to types M1, 2 and 3, it follows that the zonal index of the flow is lower for the M6 type.

Frequency: Total number of M6 types found: 141

a. Predominant sectors: II III

b. Considering all types, an M6 type occurs 4% of the time.

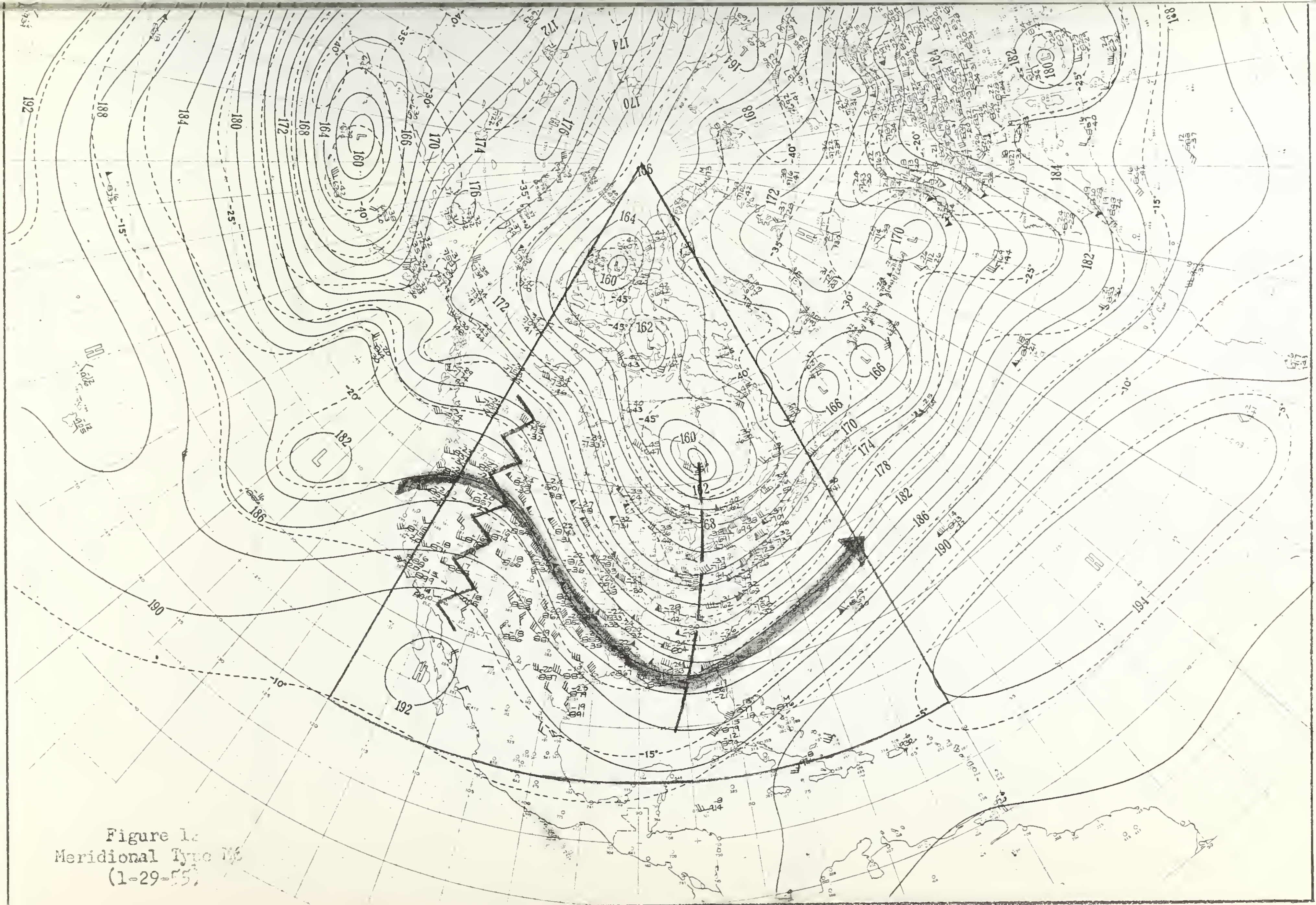
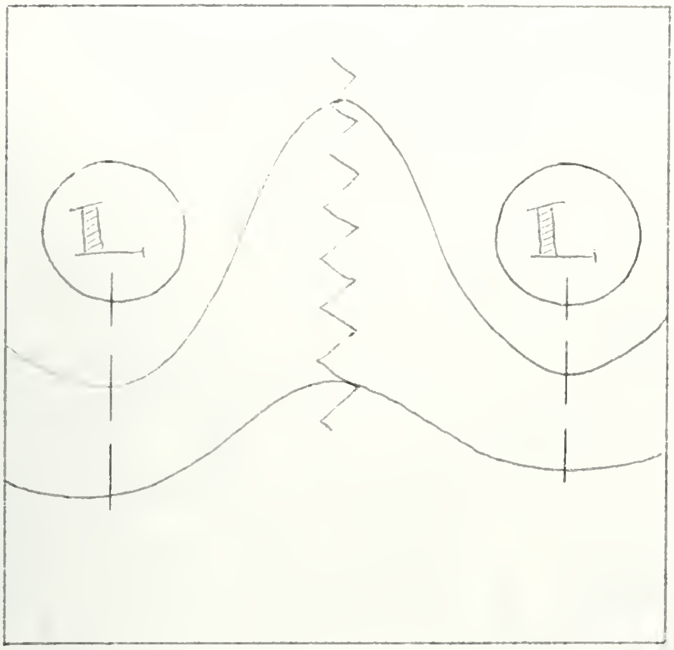
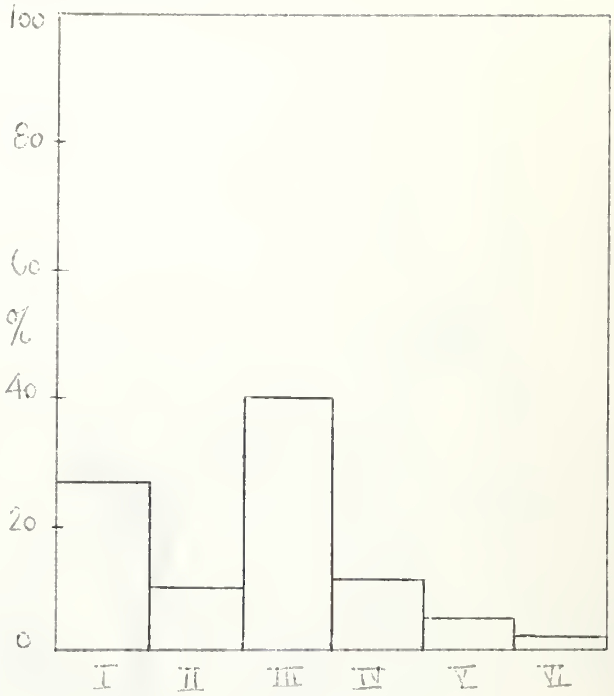


Figure 1a
Meridional Type M6
(1-29-55)

Meridional Type SEVEN - M7



Schematic Model



Percentage Frequency Distribution

This type is defined as a meridional type consisting of a trough-ridge-trough configuration of the flow. This is type is similar to type M5 in that the degree of meridional flow is the same. The frequency of this type, however, varies considerably in number and sector. It is an unstable type, usually modifying in less than 48 hours on the average.

<u>Frequency</u>: Total number of M7 types found: 65

a. Predominant sectors: I, III

b. Considering all types, an M7 type occurs 2% of the time.

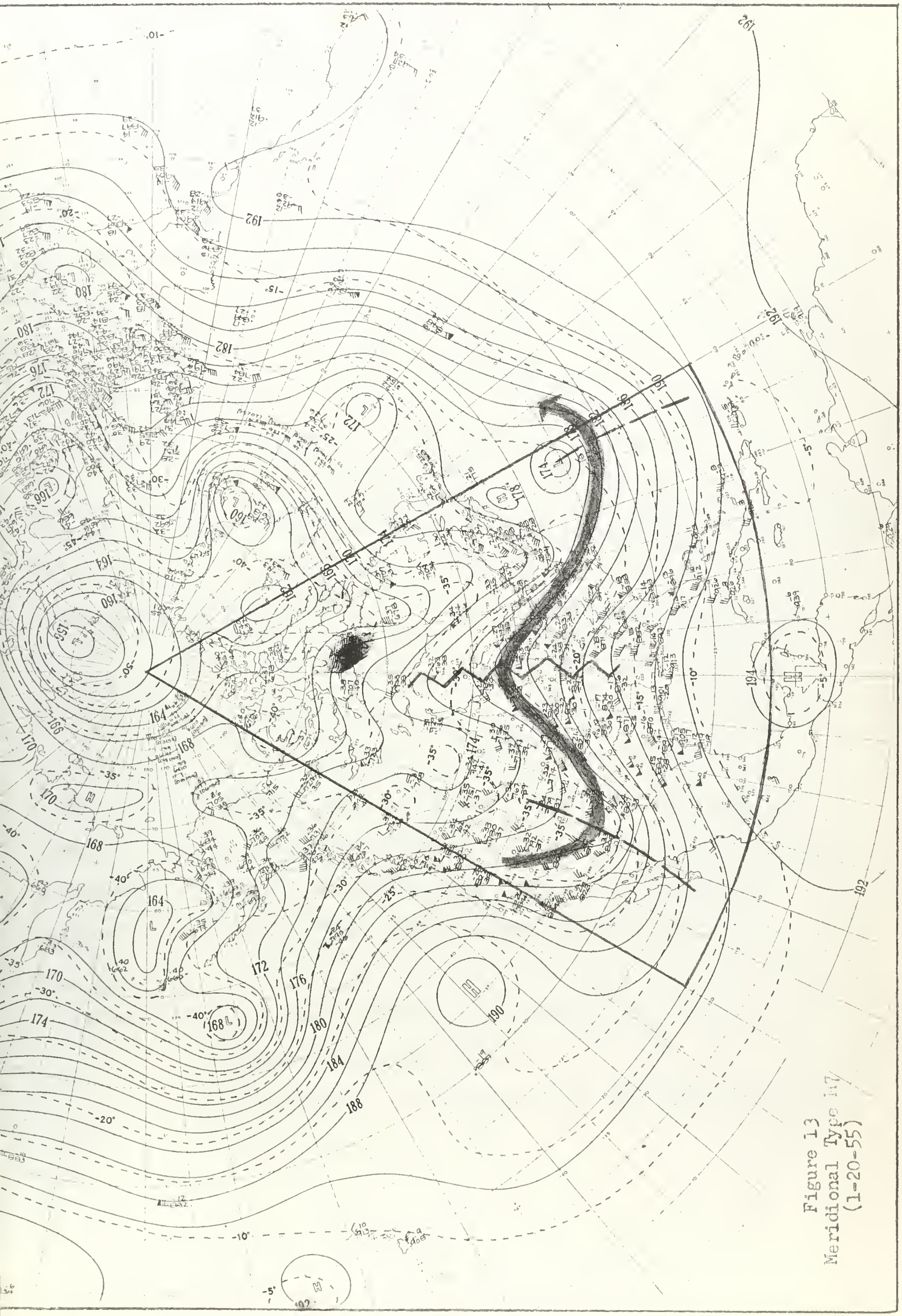
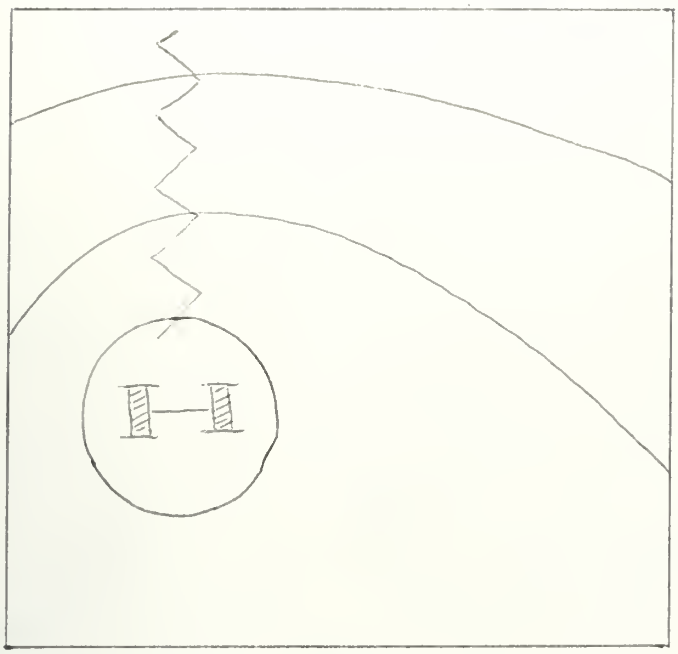
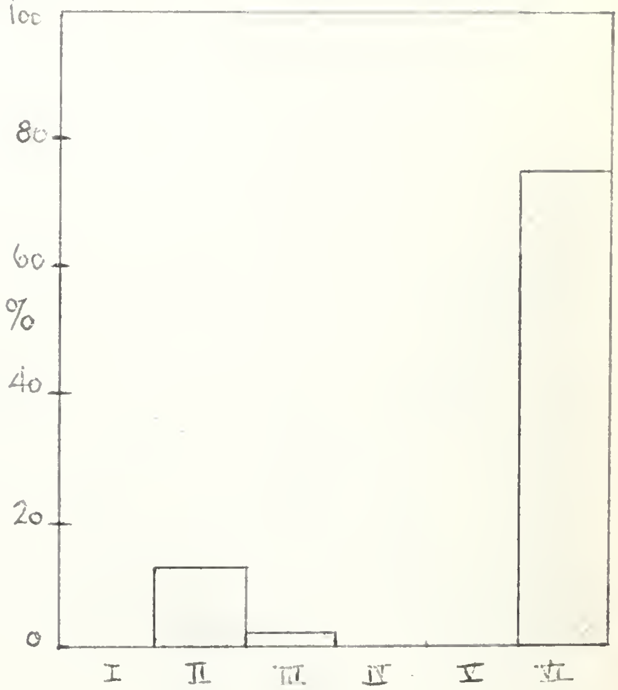


Figure 13
Meridional Type M7
(1-20-55)

Meridional Type of HT - M8



Schematic Model



Percentage Frequency Distribution

This type is defined as a meridional type consisting of a major ridge in the western region of the sector. This type is infrequently found. However, pure ridging, i.e. without troughing, does not often occur except in sector VI.

Frequency: Total number of M8 types found: 35

a. Predominant sector: VI

b. Considering all types, an M8 type occurs 1% of the time.

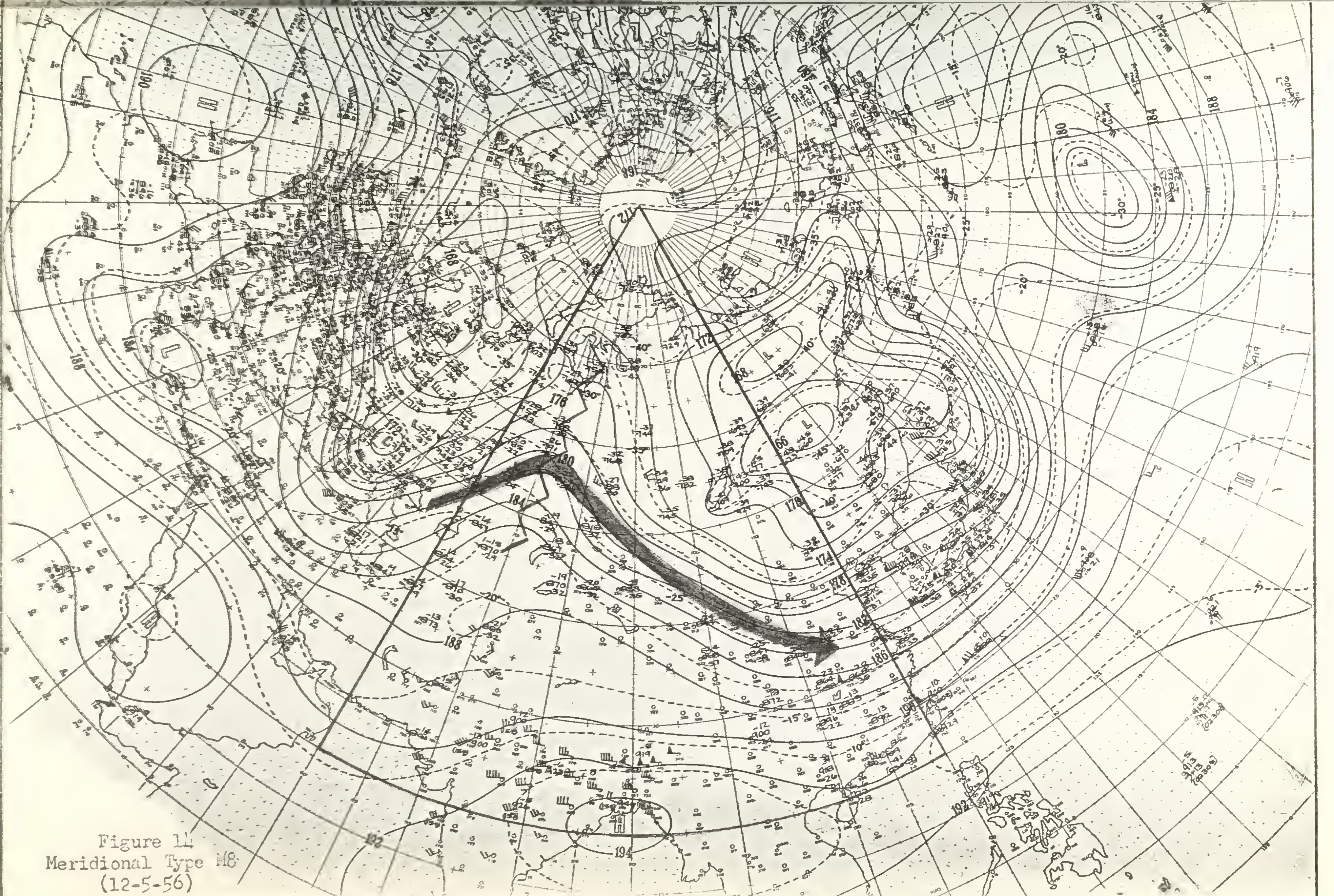
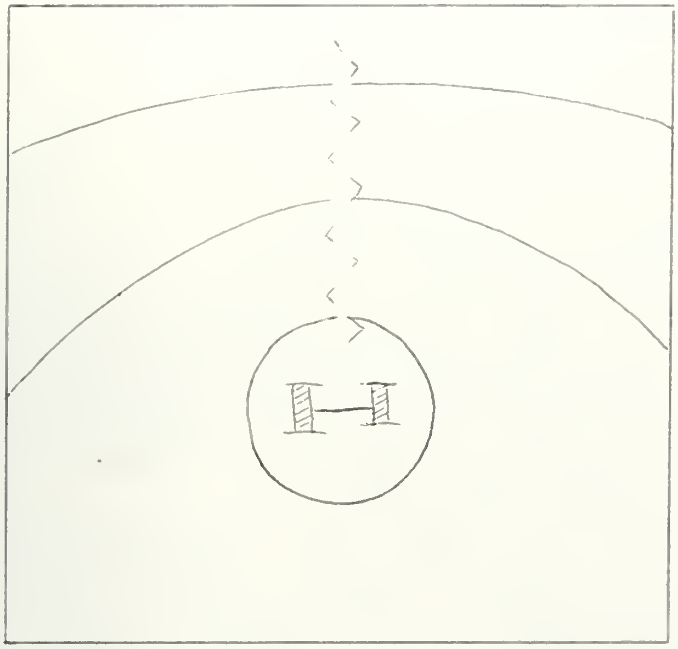
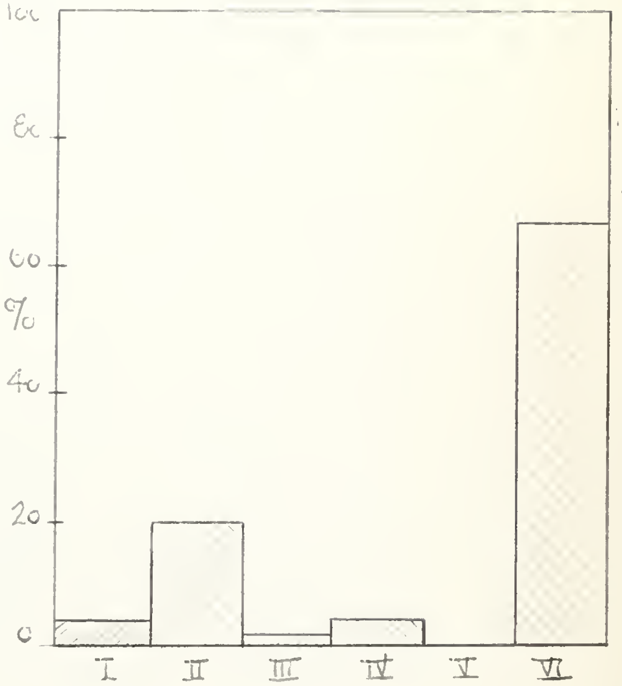


Figure 11
Meridional Type M8
(12-5-56)

Meridional Type NINE - M9





Schematic Model

Percentage Frequency Distribution

This type is defined as a meridional type consisting of a major ridge in the central region of the sector. As type M8, this type occurs mainly in sector VI with a secondary peak of frequency distribution in sector II.

Frequency: Total number of M9 types found: 43

a. Predominant sector: II, VI

b. Considering all types, an M9 occurs 1% of the time.

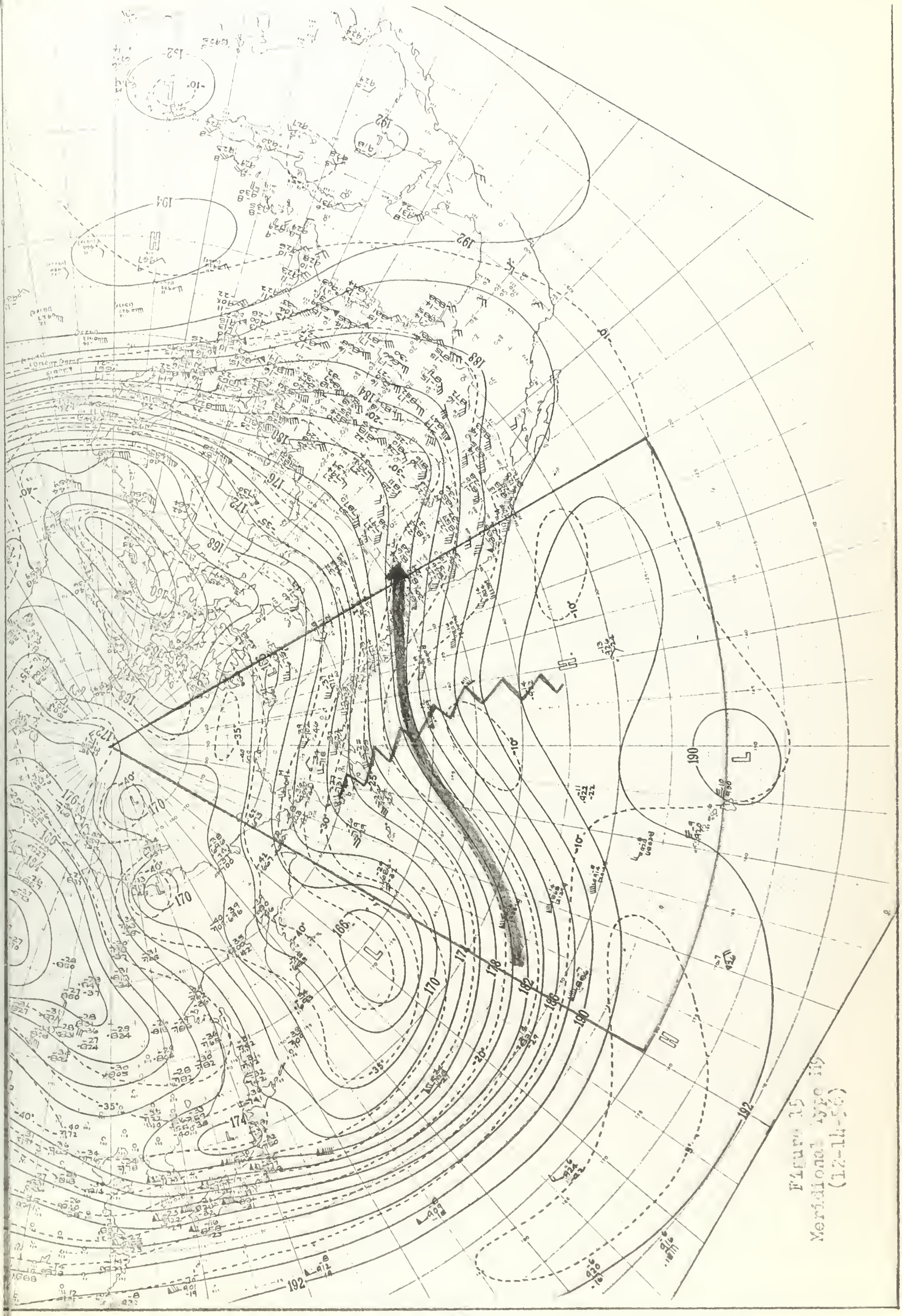
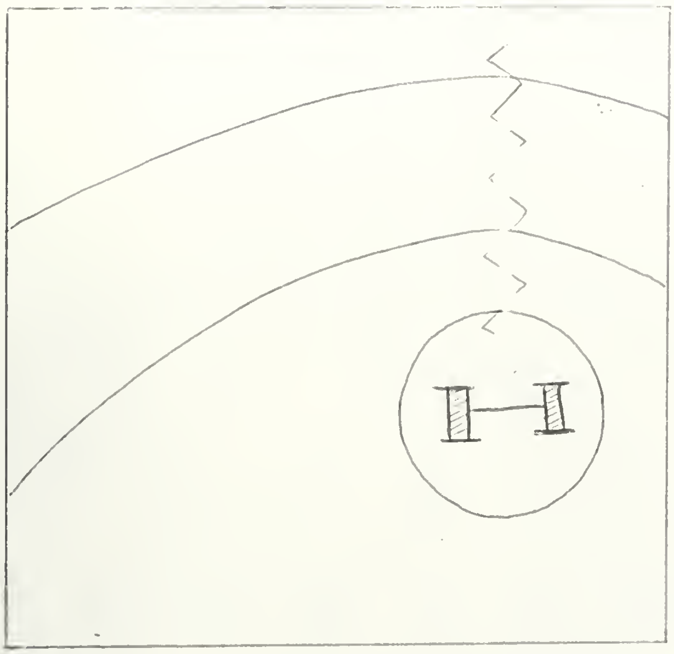
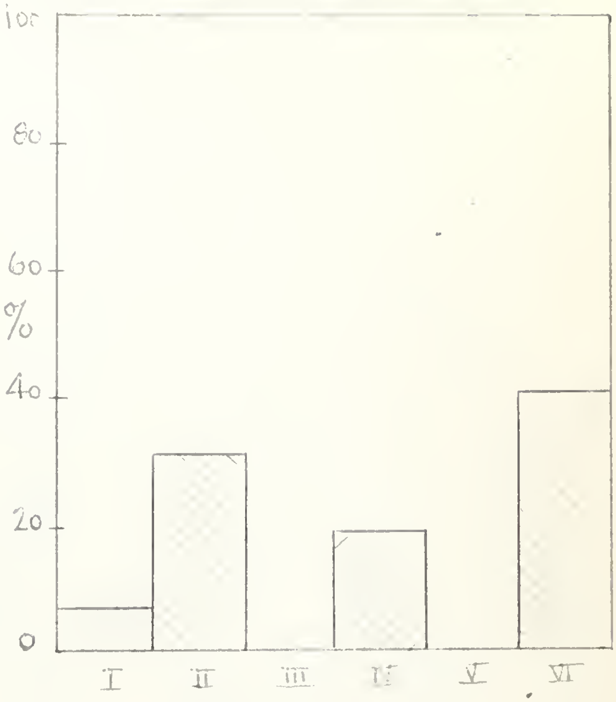


Figure 15
Meridional Type IB
(12-14-56)

Meridional Type TEM - M10



Schematic Model



Percentage Frequency Distribution

This type is defined as a meridional type consisting of a major ridge in the eastern region of the sector. This type is found in sectors which contain west coasts of continents as well as in sector VI.

Frequency: Total number of M10 types found: 63

a. Predominant sectors: II, IV, VI

b. Considering all types, an M10 type occurs 2% of the time.

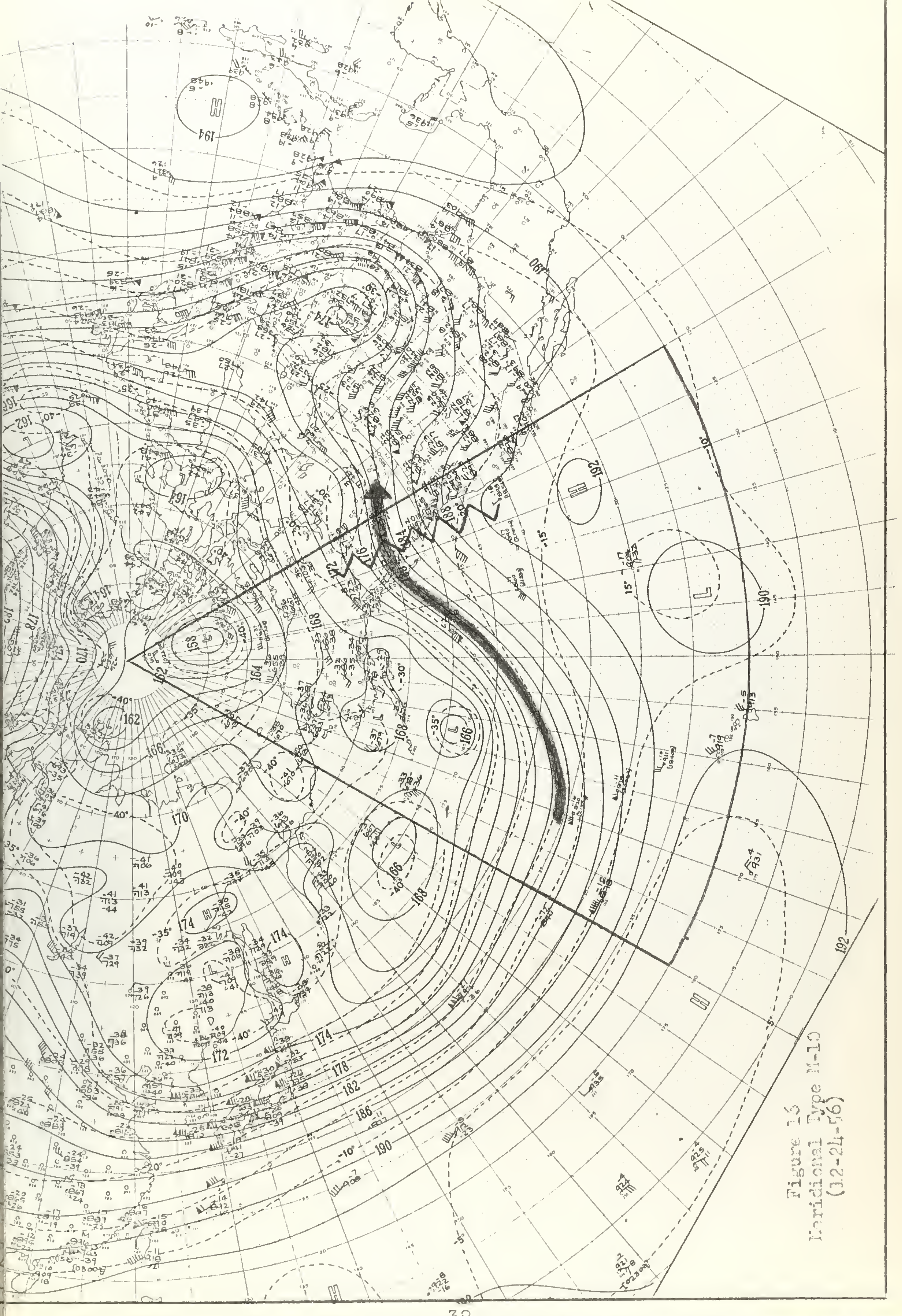
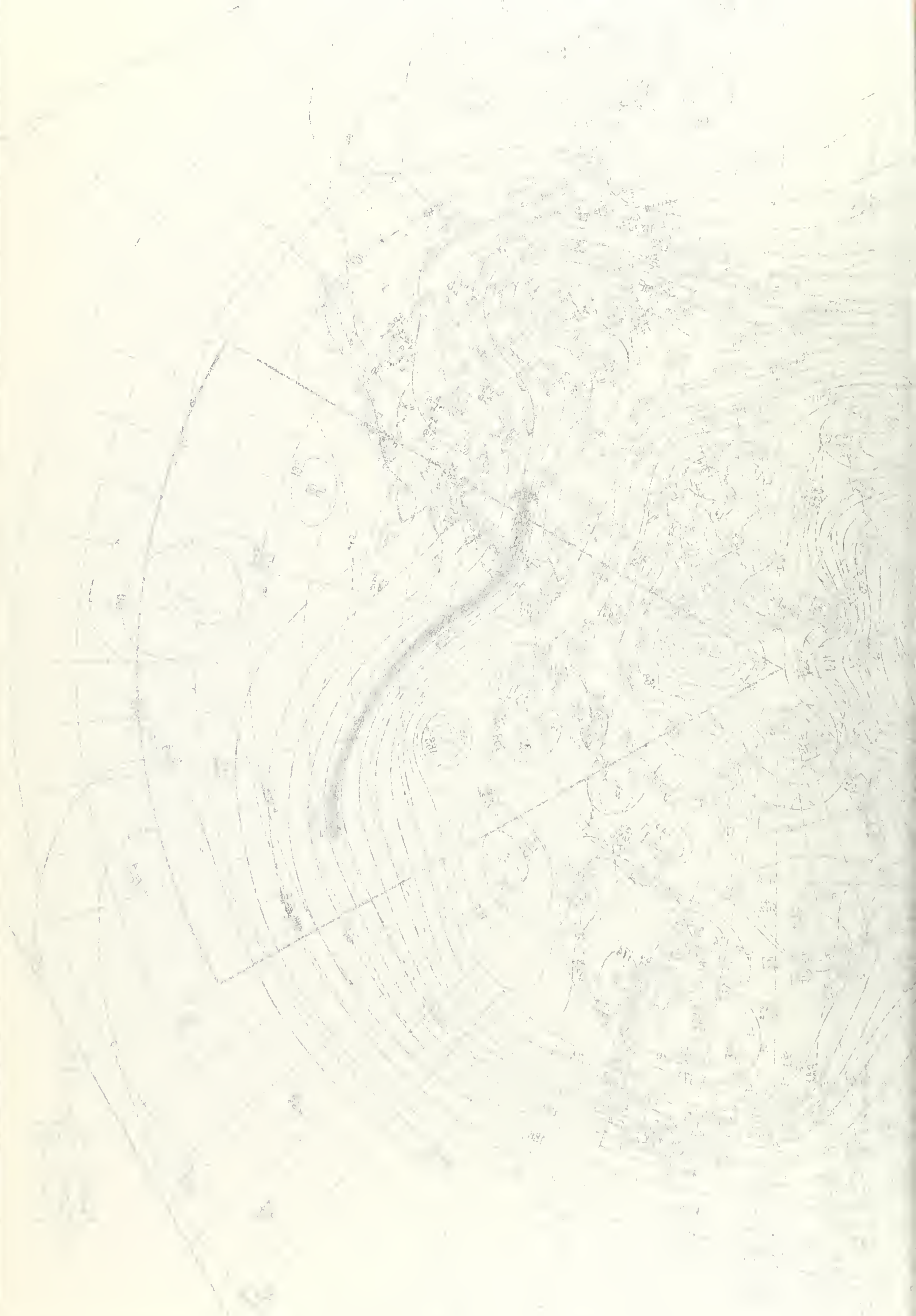
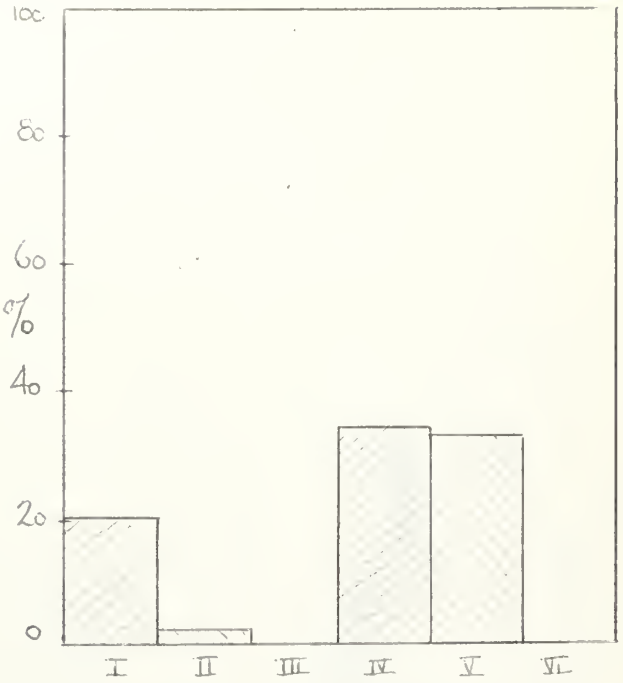


Figure 15
Meridional Type M-10
(12-24-56)



Meridional Type ELEVEN - M11

Percentage Frequency Distribution



This type is defined as a complex meridional type whose significant feature is diverging flow in the eastern region of the sector. This type is unique to sectors I, IV, and V with an occasional type occuring in sector II. Example 1 (sectors I, II, IV) shows a prominent trough in the western part of the sector with distinct divergence of flow downstream. Example 2 is unique to sector V and is characterized by zonal flow in the western portion of the sector followed by a diffuse divergence downstream.

Frequency: Total number of M11 types found: 118

a. Predominant sectors: I, IV, V

b. Considering all types, an M11 type occurs 4% of the time.

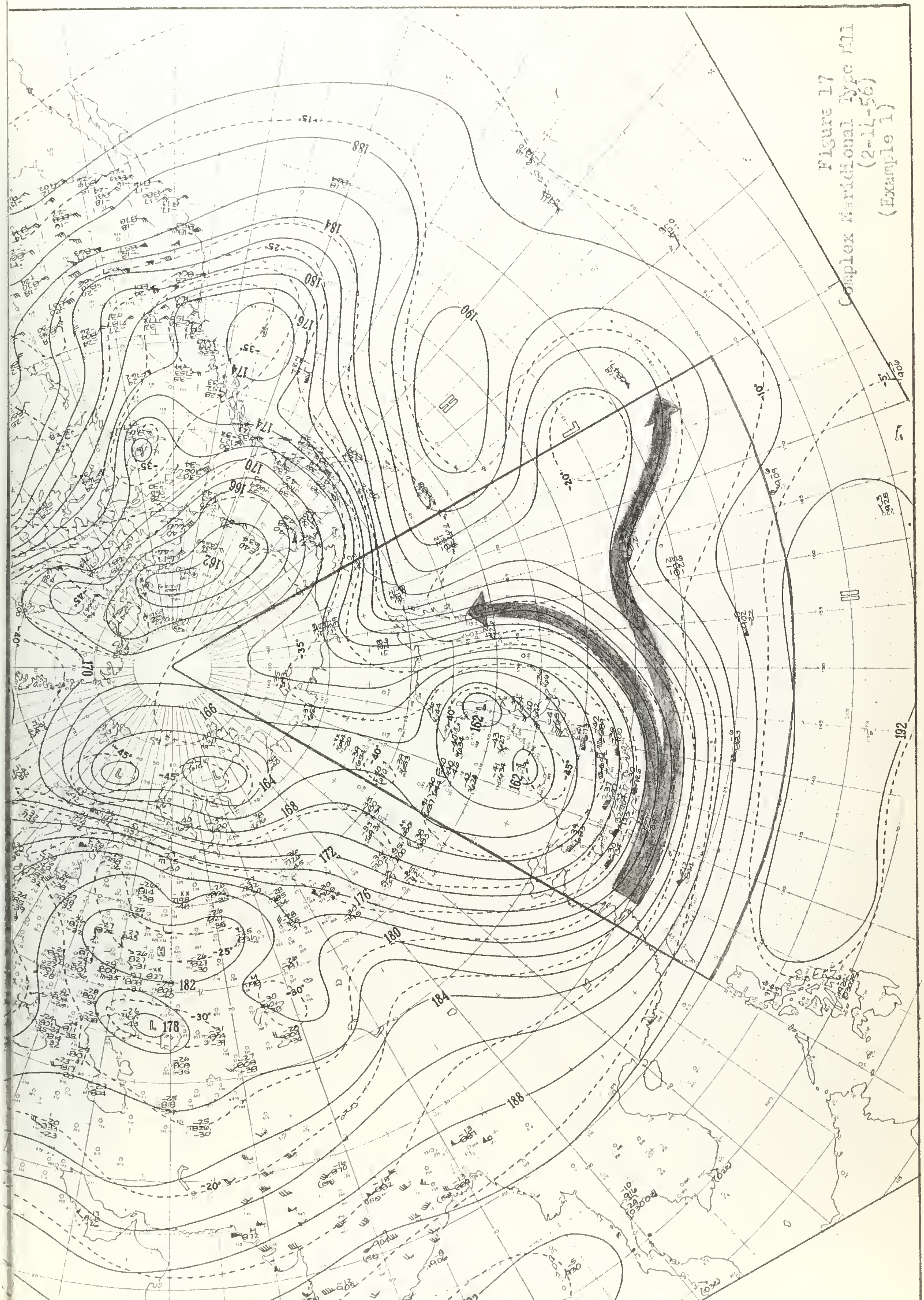


Figure 17
Complex Meridional Type M11
(2-14-56)
(Example 1)

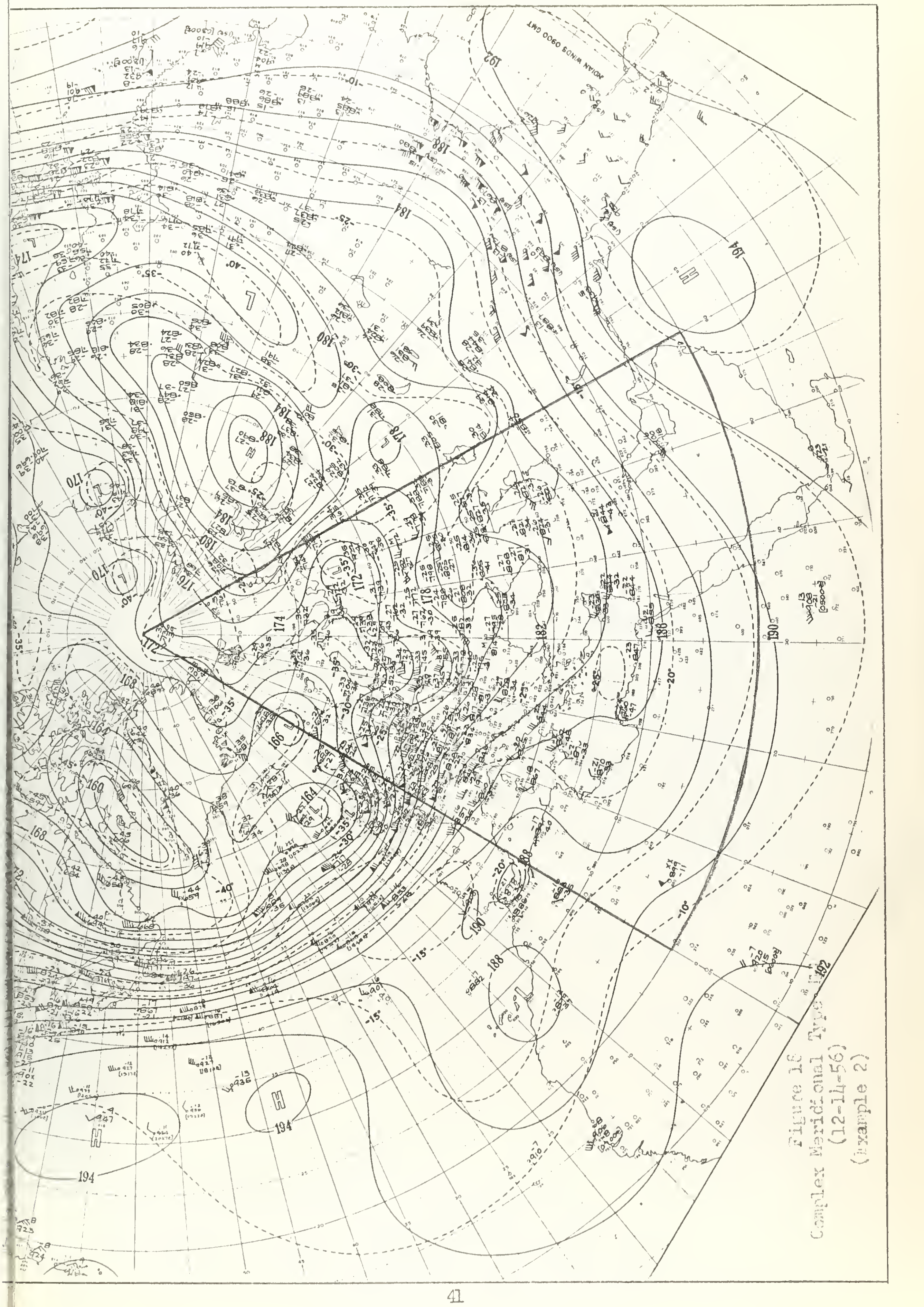
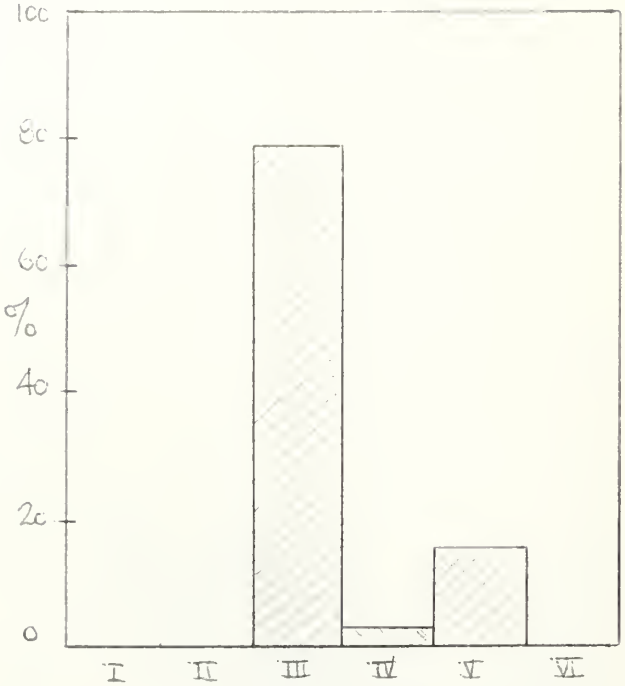


Figure 18
Complex Meridional Type
(12-14-56)
(Example 2)

Meridional Type TWELVE - M12

Percentage Frequency Distribution



This type is defined as a complex meridional type whose significant feature is converging flow in the eastern portion of the sector. This type is unique to sector III, and is a relatively persistent pattern usually associated with a quasi-stationary trough over the western United States and a stationary cold low over Canada. The flow in the western region of the sector is split.

Frequency: Total number of M12 types found: 72

a. Predominant sector: III

b. Considering all types, an M12 occurs 2% of the time.

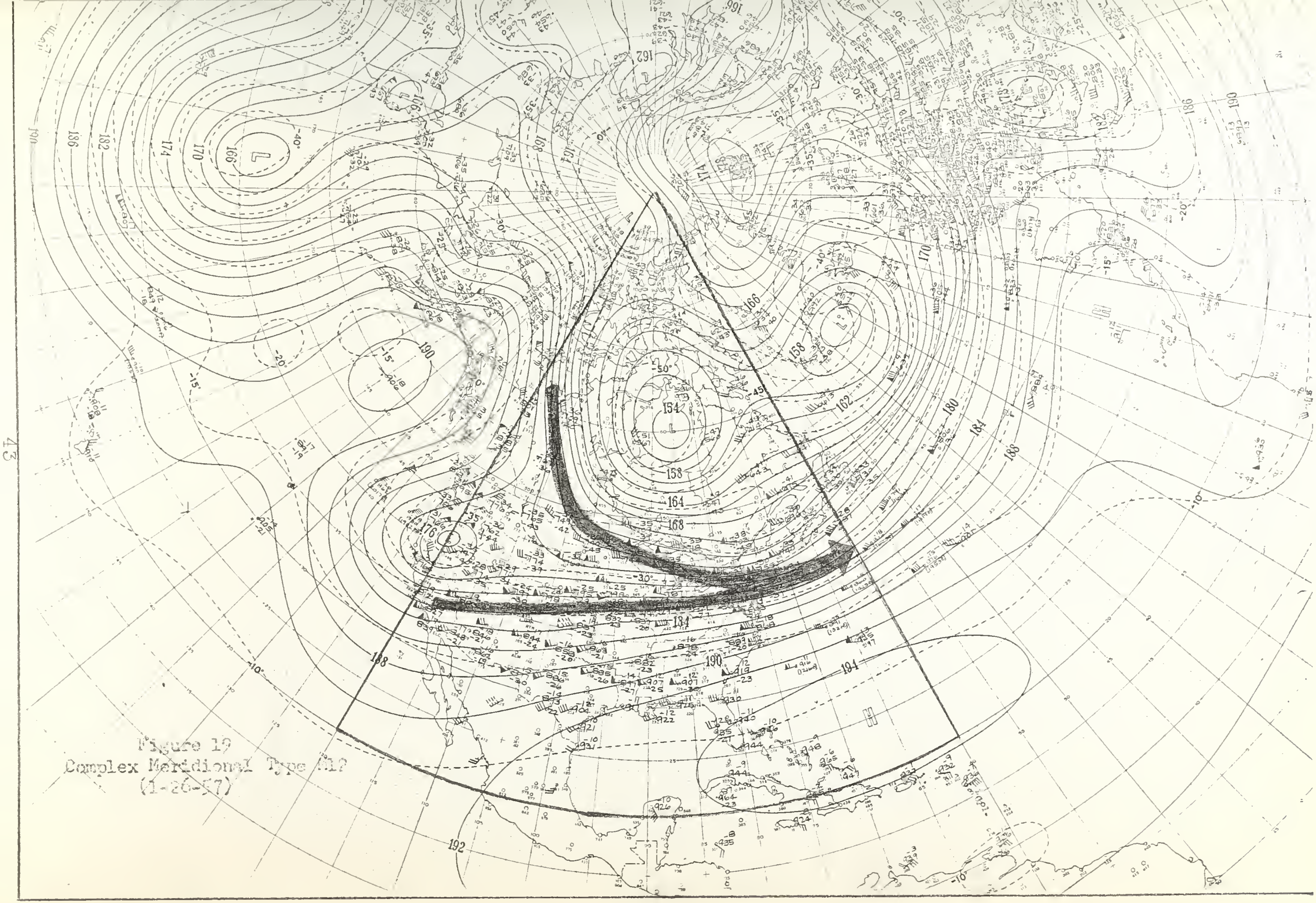
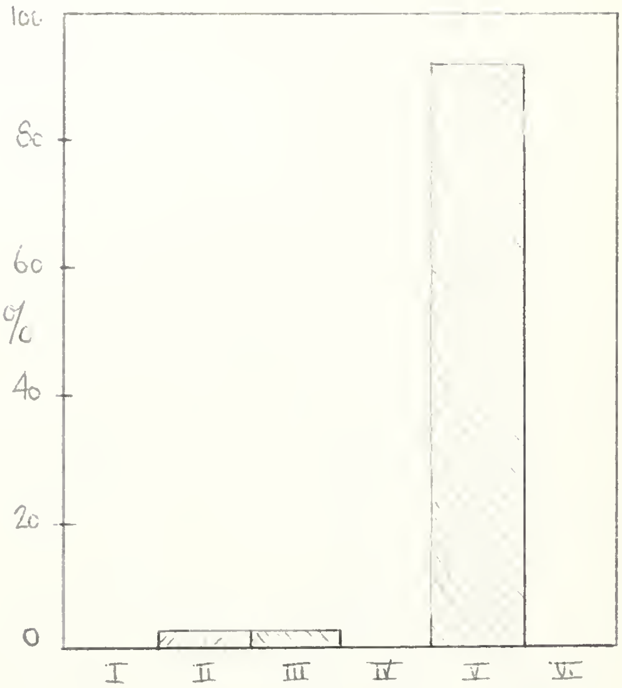


Figure 19
Complex Meridional Type M12
(1-26-57)

Meridional Type THIRTEEN - M13

Percentage Frequency Distribution



This type is defined as a complex meridional type whose significant pattern is diverging split flow in sector V. This flow is quite stable since it is usually associated with a block or prominent ridge in the eastern region of sector IV. This type is similar to type M12 except that the flow in the interior of Europe is split and does not exhibit the convergence of M12.

Frequency: Total number of M13 types found: 120

a. Predominant sector: V

b. Considering all types, an M13 type occurs 4% of the time.

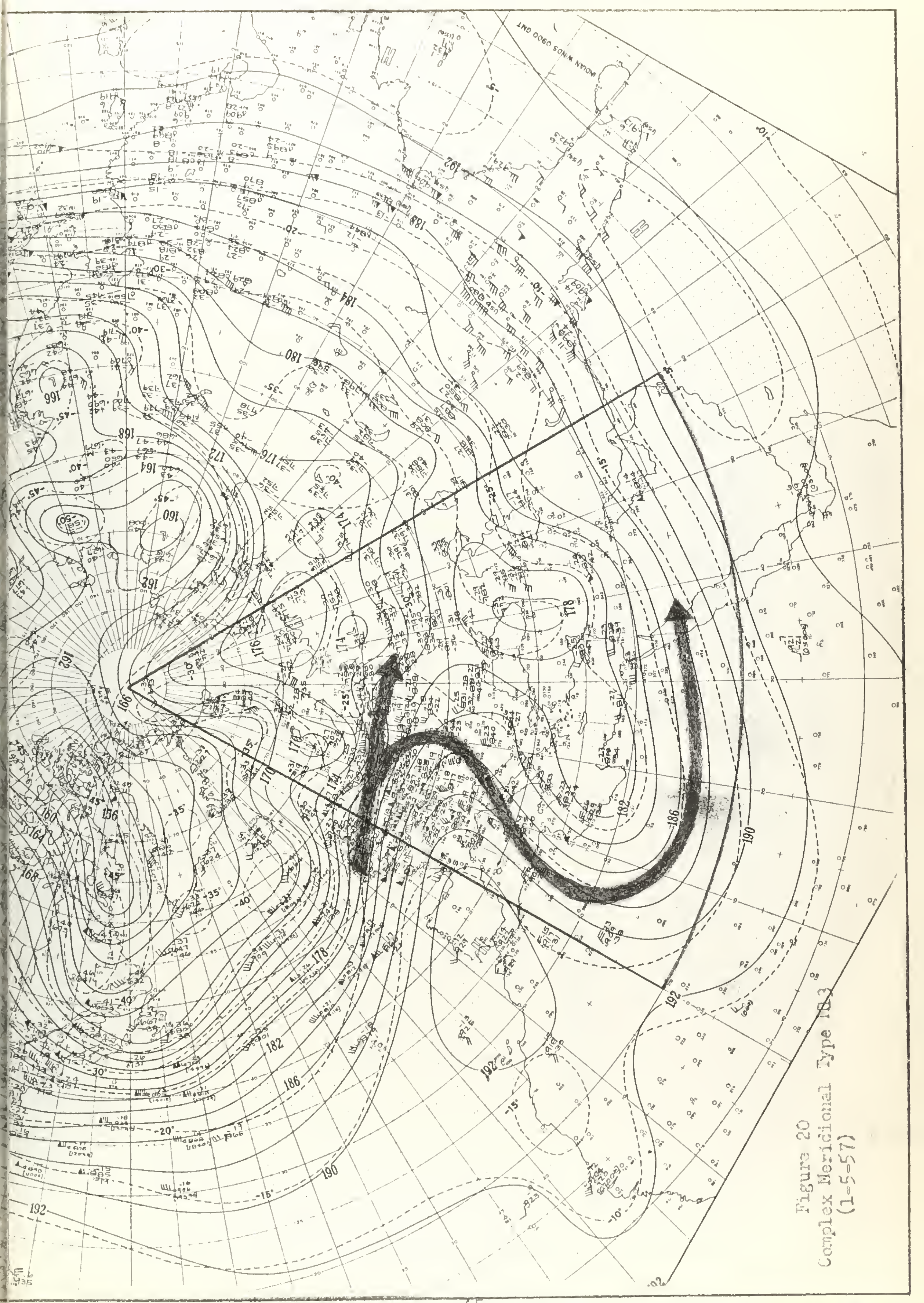


Figure 20
Complex Meridional Type III
(1-5-57)

TABLE I

Statistical Summary of Meridional and Zonal Weather Types

Weather Types	Sector and Type Totals I	II	III	IV	V	VI	Total	J	F	M	A	B	C	D	E
Z1	198	6	33	4	9	42	292	90	131	71	I	F	4	5	14
Z2	25	28	38	11	9	30	141	38	50	53	III	M	3	4	10
Z3	49	14	66	13	10	141	293	104	53	136	VI	M	4	5	19
Z4	3	11	66	13	85	14	318	130	70	18	V	J	3	2	18
M1	23	12	14	14	15	1	79	38	24	17	I	J	1	1	3
M2	27	13	40	12	13	2	107	37	32	38	III	J,M	2	1	4
M3	23	3	23	4	9	1	63	23	16	24	I,III	J,M	1	1	3
M4	30	52	23	38	25	4	172	56	76	40	II	F	1	2	7
M5	1	15	15	4	0	0	35	7	11	17	II,III	M	1	1	3
M6	9	28	74	10	20	0	141	48	35	58	III	M	2	2	5
M7	18	7	26	8	4	2	65	18	18	29	III	M	1	1	2
M8	0	5	3	1	0	26	35	15	14	16	VI	-	2	2	4
M9	2	9	1	2	0	29	43	13	13	17	VI	M	2	1	6
M10	4	21	0	12	0	26	63	34	10	19	VI	J	2	2	3
M11	25	3	0	41	39	10	118	47	30	40	IV,V	J	3	3	9
M12	0	0	57	3	12	0	72	19	26	27	III	F,M	2	2	6
M13	0	2	4	1	113	0	120	67	38	15	V	J	3	4	9

Sector and Type Summary of Weather Type Occurrence

J,F, and M: Weather Type occurrence for January, February, and March

A: Predominant sector for each type

B: Predominant month for each type

C: Average persistence of each type in its dominant sector (days)

D: Average persistence for each type during its dominant month (days)

E: Maximum persistence observed in this sample of 542 days

C. Blocking Types

No individual type description is given for blocking types other than a representative illustrative example of each. (The reader is referred to [6,7] for a detailed description and analysis of the Pan American Airways (PAA) blocking types.) The regional distribution of the major blocking areas is shown in figures 21 and 22. Winter months include December, January, and February. Spring months are March, April, and May.

The Western Canadian Block (sector III), the Near-East Block (sector V) and the East Siberian Block (sector VI) were added to the catalogue of PAA blocking types to identify certain blocking patterns not covered by the PAA types. These special blocks are described by illustrative examples of each pattern.

Each illustration of the type shows the average position of the flow and related closed high cell. A shaded zone in the illustration indicates the area the closed high must occupy and still classify as that particular blocking type.

An analysis of the distribution of blocks is discussed in Chapter II. The table below compares the overall frequency of blocks to the basic zonal and meridional types.

Basic pattern	Number of cases	Percentage of occurence
Blocking	1092	34%
Zonal	1045	32%
Meridional	1115	34%
Total number of cases:	3252	100%

Catalogue of Blocking Types

Sector ONE

B1 - Bering Sea-Western Alaska Block (Winter)

B2 - Beaufort Sea Block (Winter)

B3 - Kamchatka Block (either Winter or Spring)

Sector TWO

B1 - Beaufort Sea Block (Winter)

B2 - Mid-latitude East Pacific Block (Spring)

B3 - Pacific West Coast Block (Winter)

B4 - East Central Pacific Block (Winter)

B5 - Sub-Aleutian Block (Winter) or,
Alaska Block (Spring)

B6 - Bering Sea-Western Alaska Block (Winter)

Sector THREE

B1 - Canadian Block (Spring)

B2 - Western Canadian Block (authors' title)

B3 - Greenland-Newfoundland Block (Spring)

Sector FOUR

B1 - Sub-Icelandic Block (Winter)

B2 - Mid-latitude East Atlantic Block (Winter)

B3 - England-North Sea Block (Winter)

B4 - Bay of Biscay Block (Winter)

B5 - Greenland-Newfoundland Block (Spring)

B6 - England-Icelandic Block (Spring)

Sector FIVE

B1 - Near East Block (authors' title)

B2 - Ural Block (Spring)

B3 - European-Scandanavian Block (Spring)

B4 - England-North Sea Block (Winter)

B5 - Scandanavian-Baltic Block (Winter)

B6 - European-Russian Block (Winter)

Sector SIX

B1 - East Siberian Block (authors' title)

B2 - Ural Block (Spring)

B3 - Ural Block (Winter)

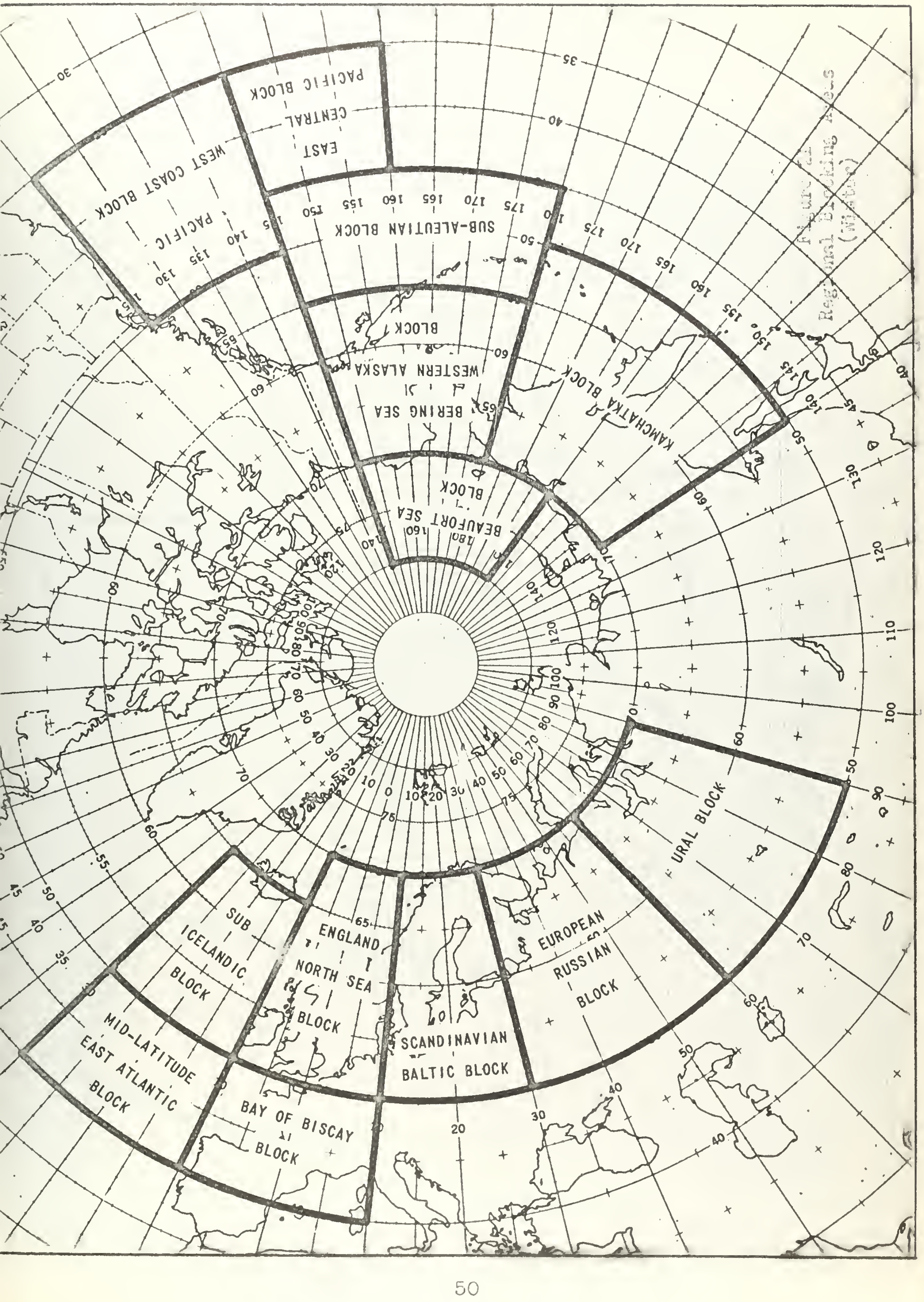


Figure 11
Regional Blocking Areas
(Winter)

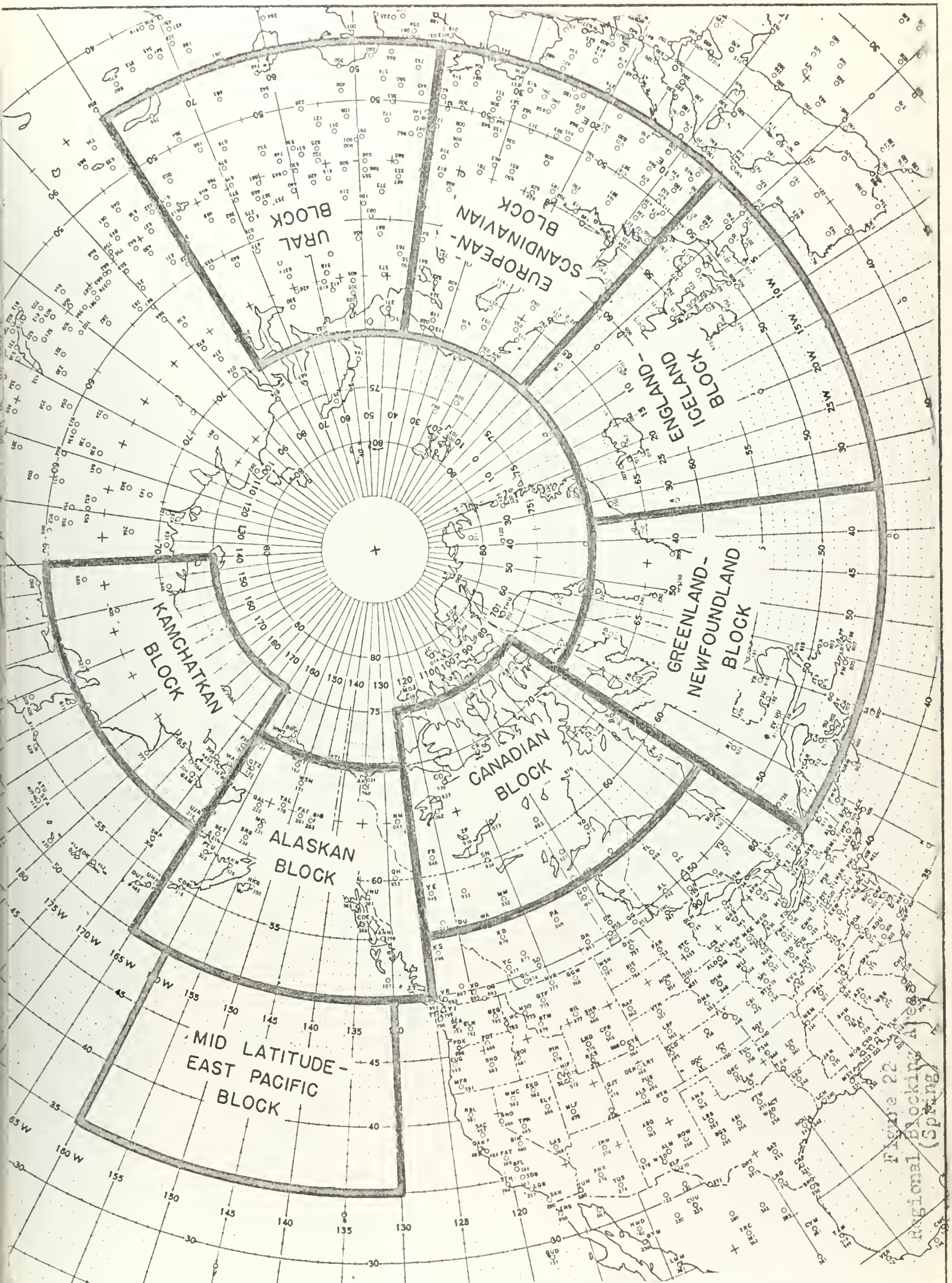
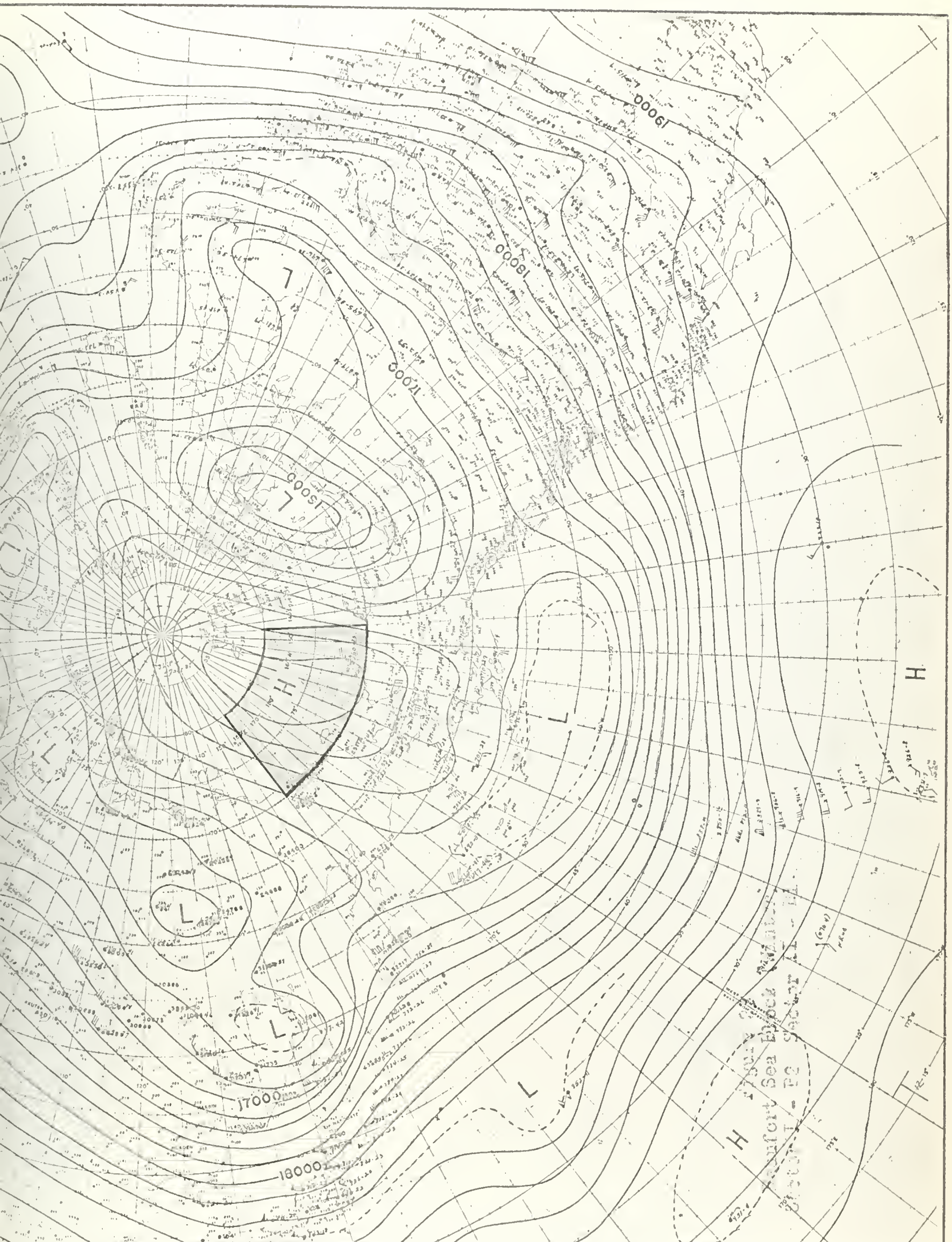


Figure 22
Regional Blocking Areas
(Spring)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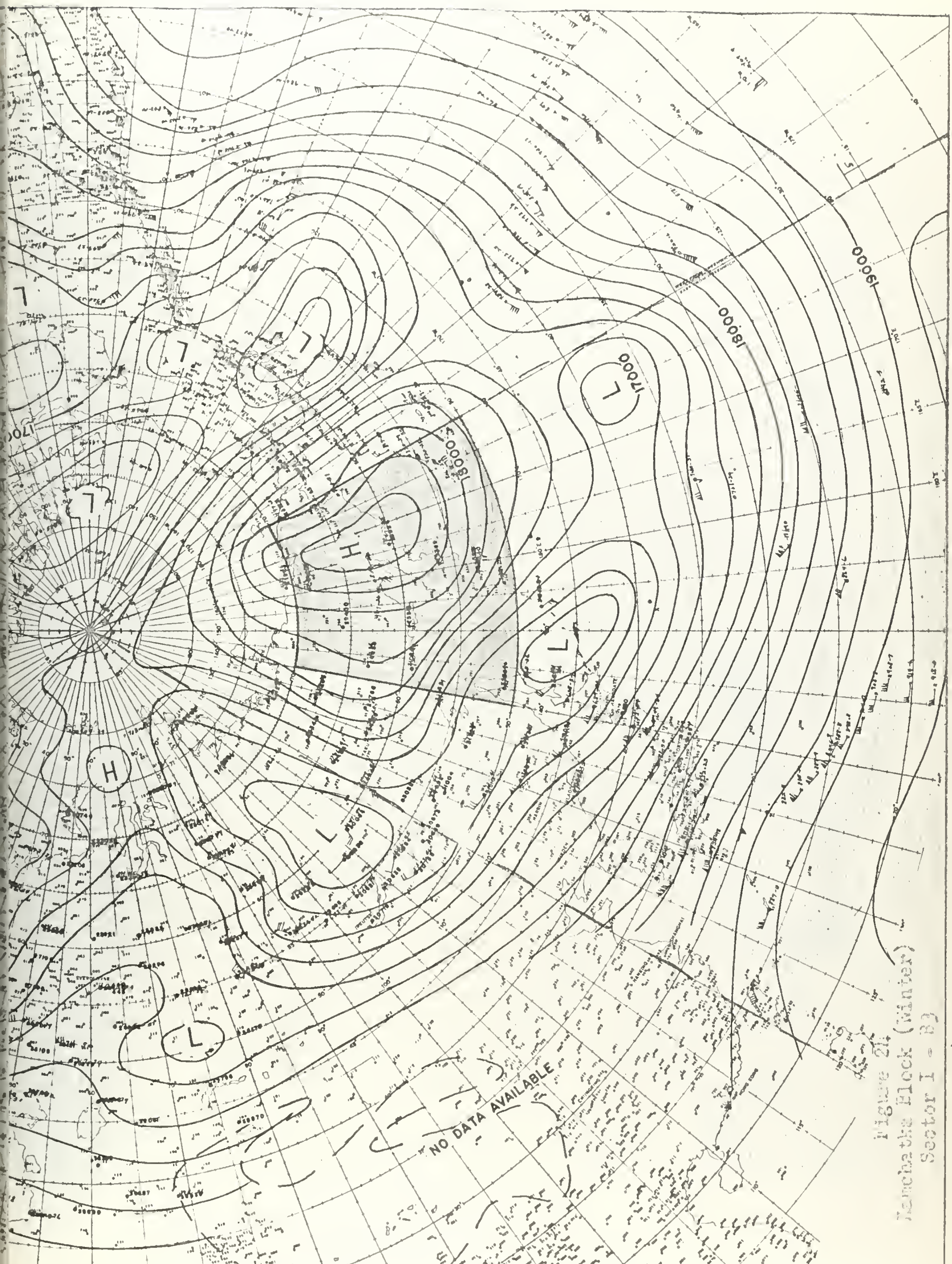


Figure 21
Kamchatka Block (Winter)
Sector I - B3

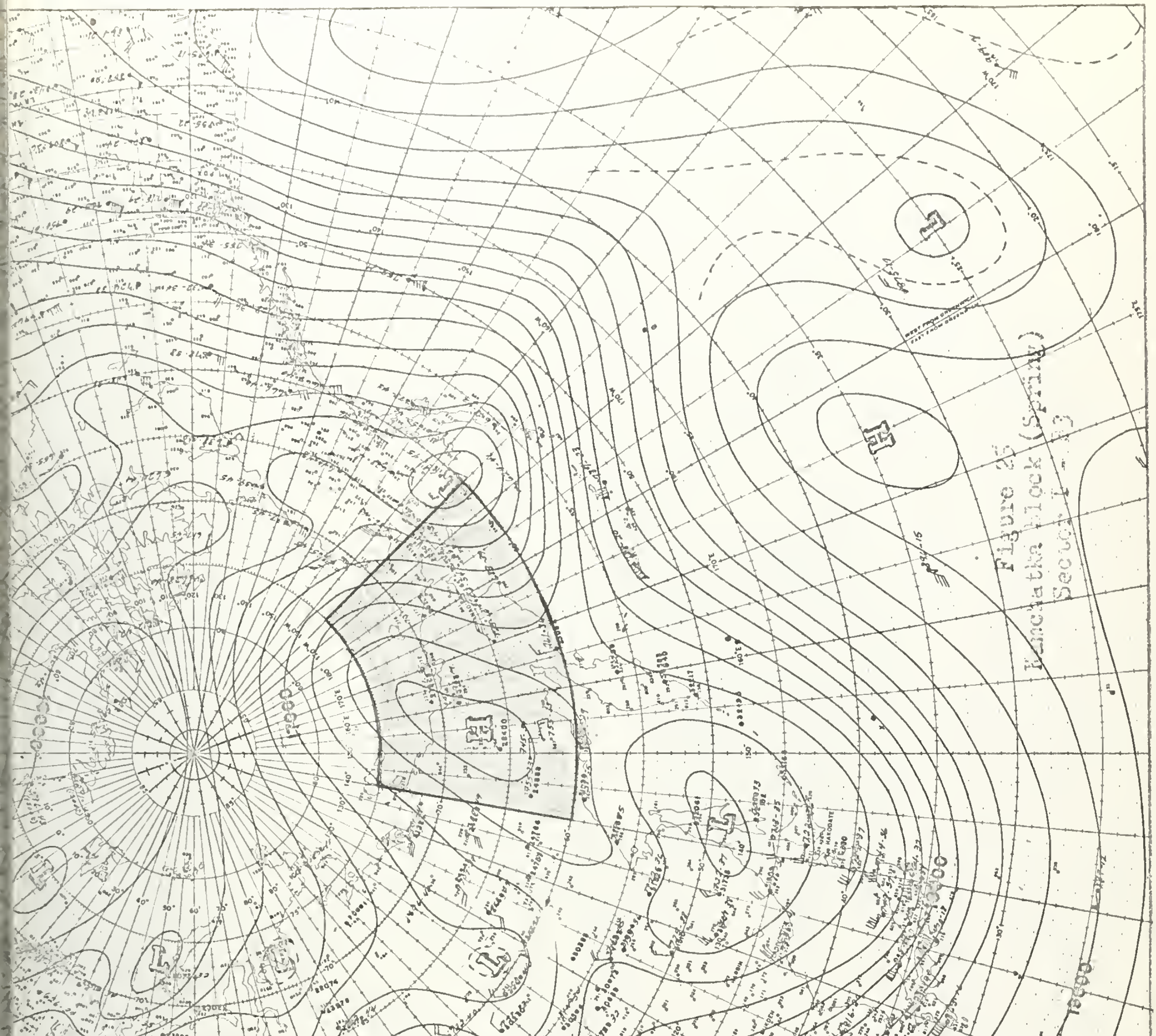


Figure 25
Kamchatka Block (Spring)
Sector I

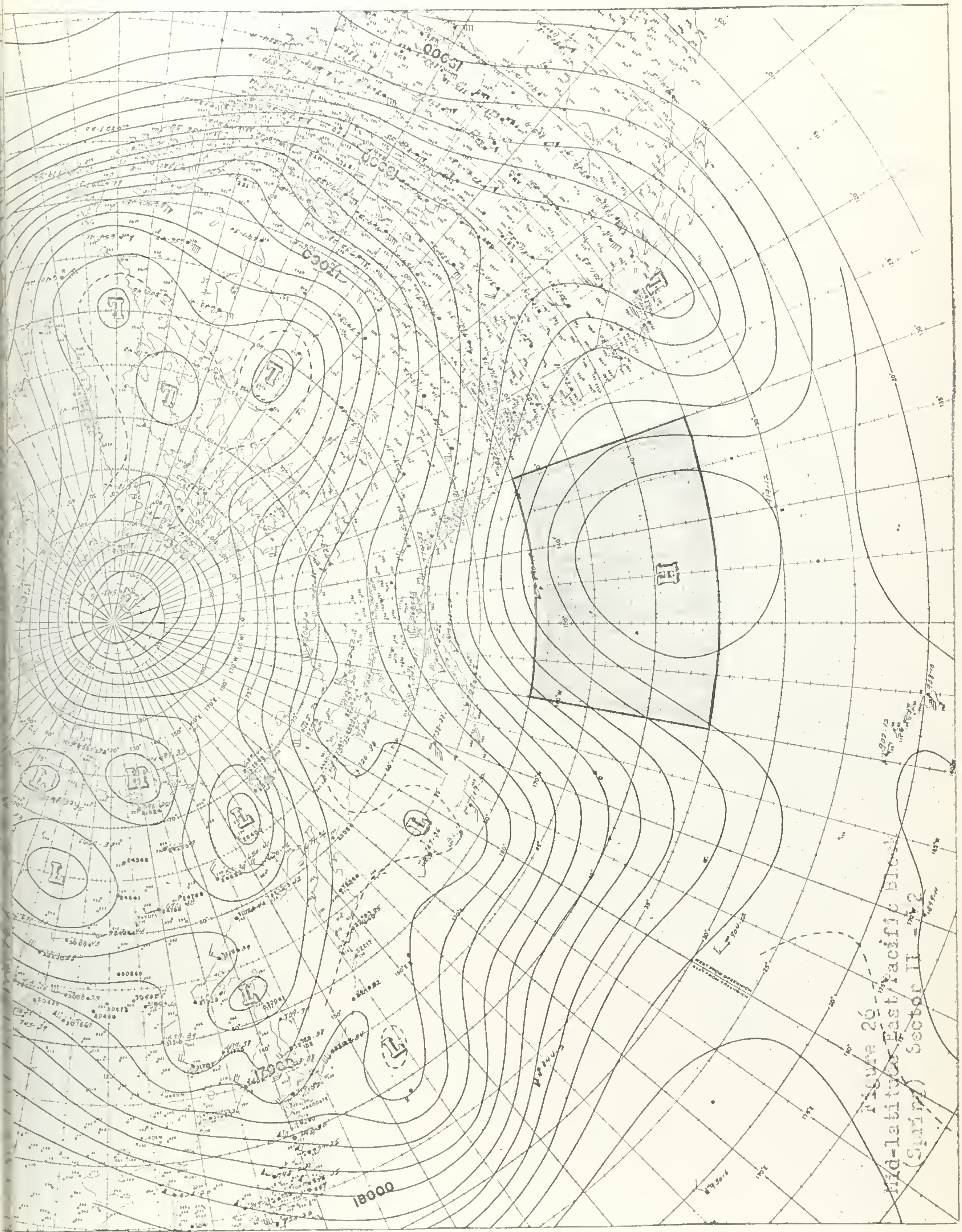


Figure 26
Mid-latitude East Pacific Block
(Spring) Sector II - 2

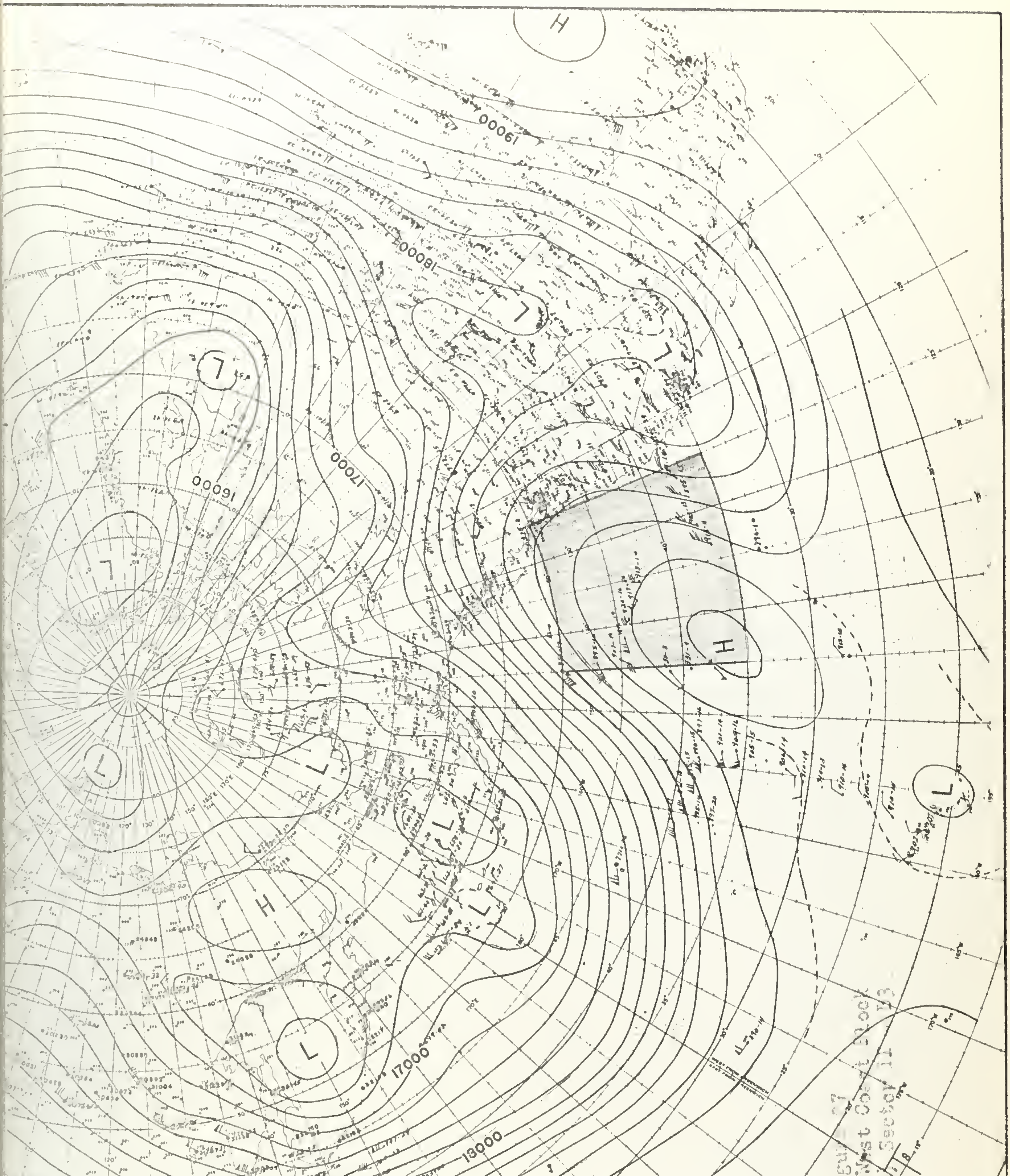
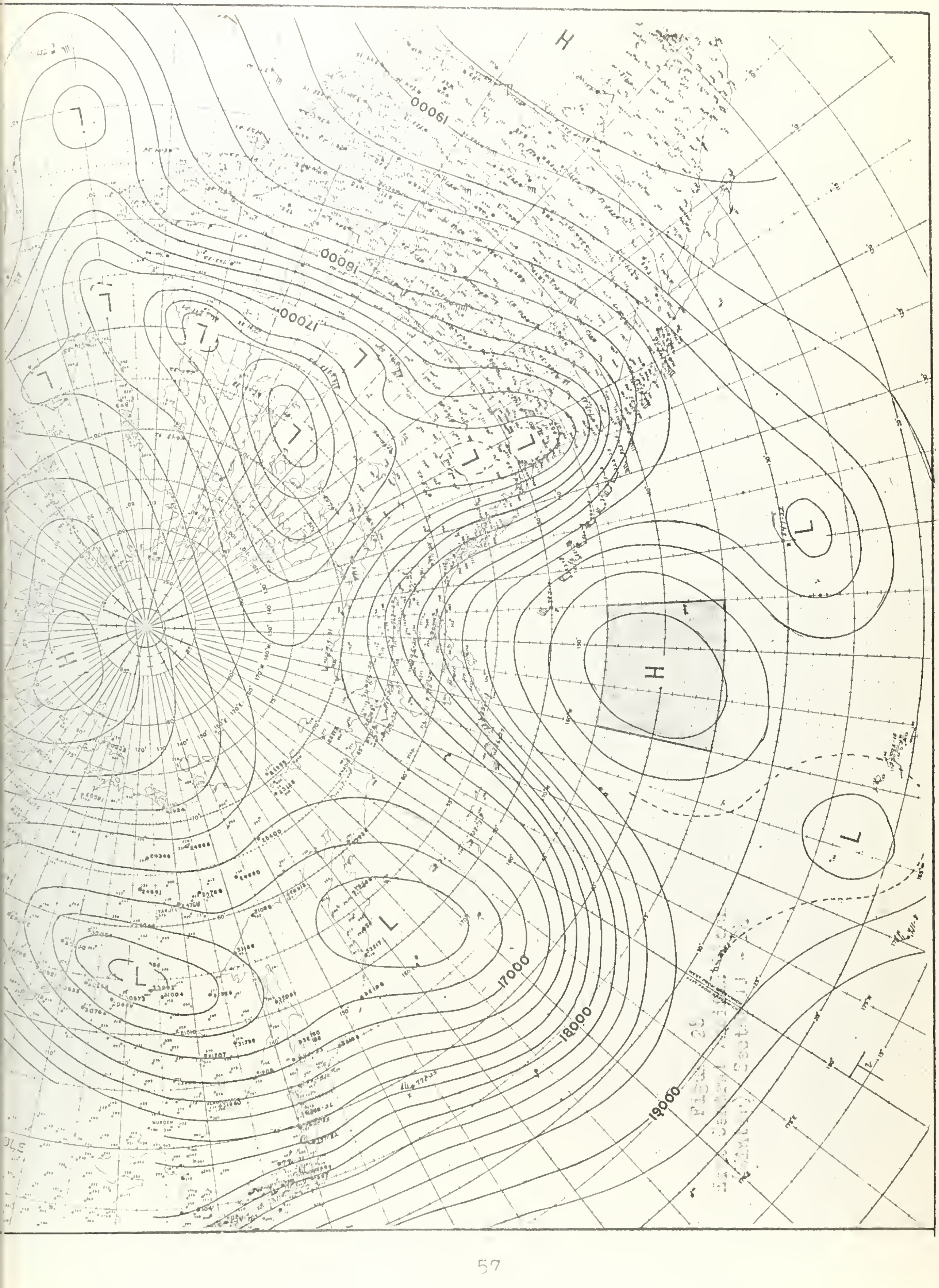


Figure 27
Pacific West Coast Block
(Winter) Sector II - B3



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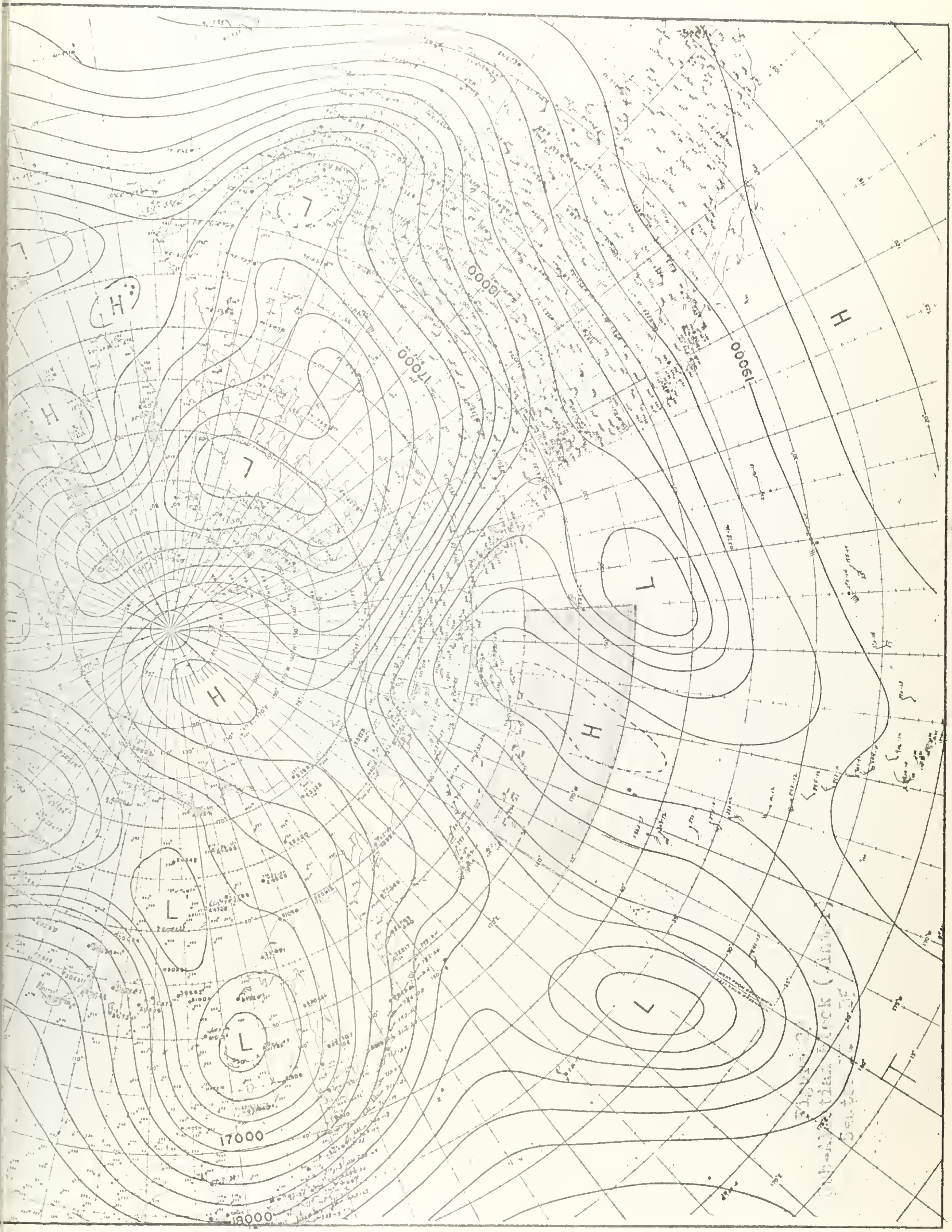
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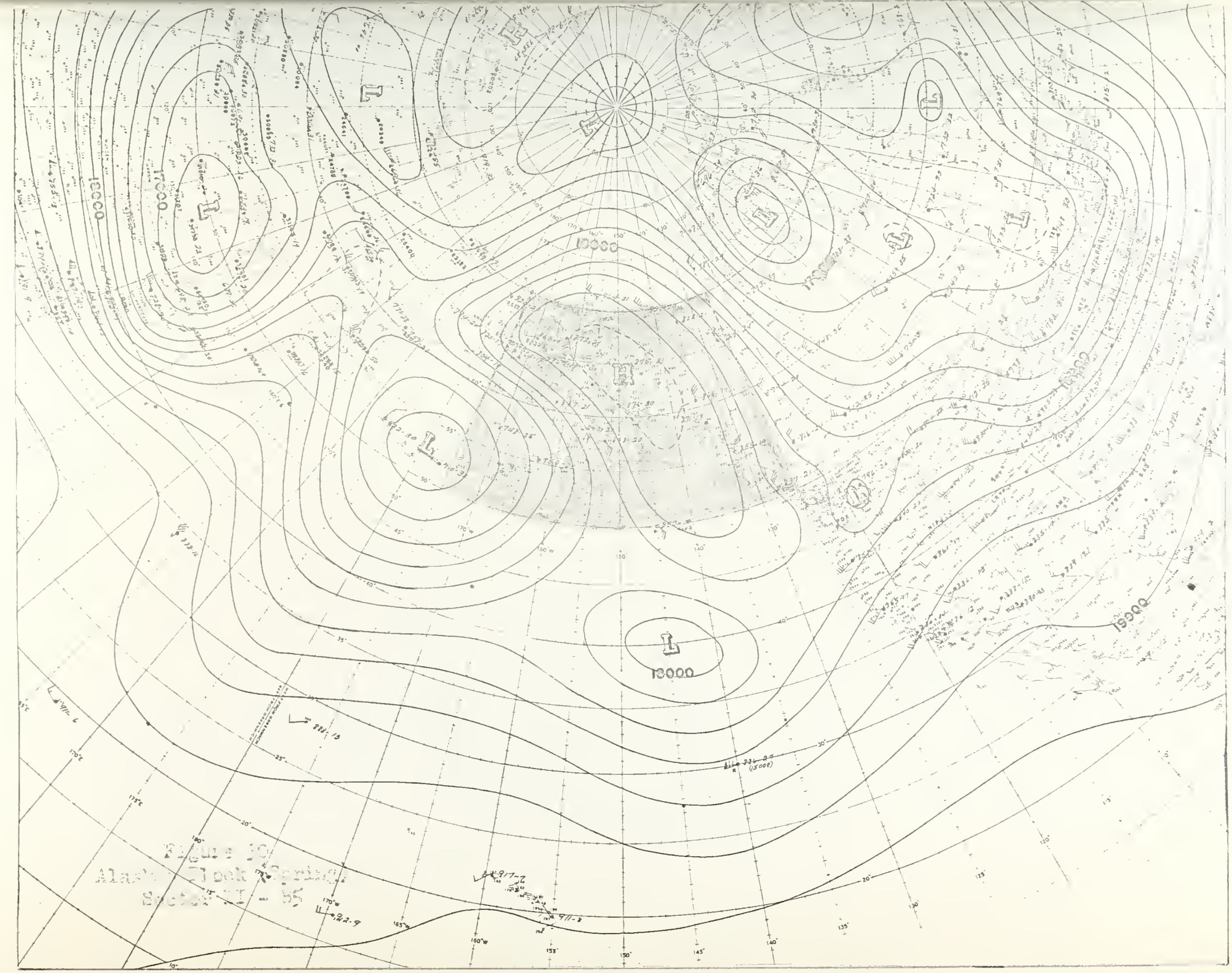
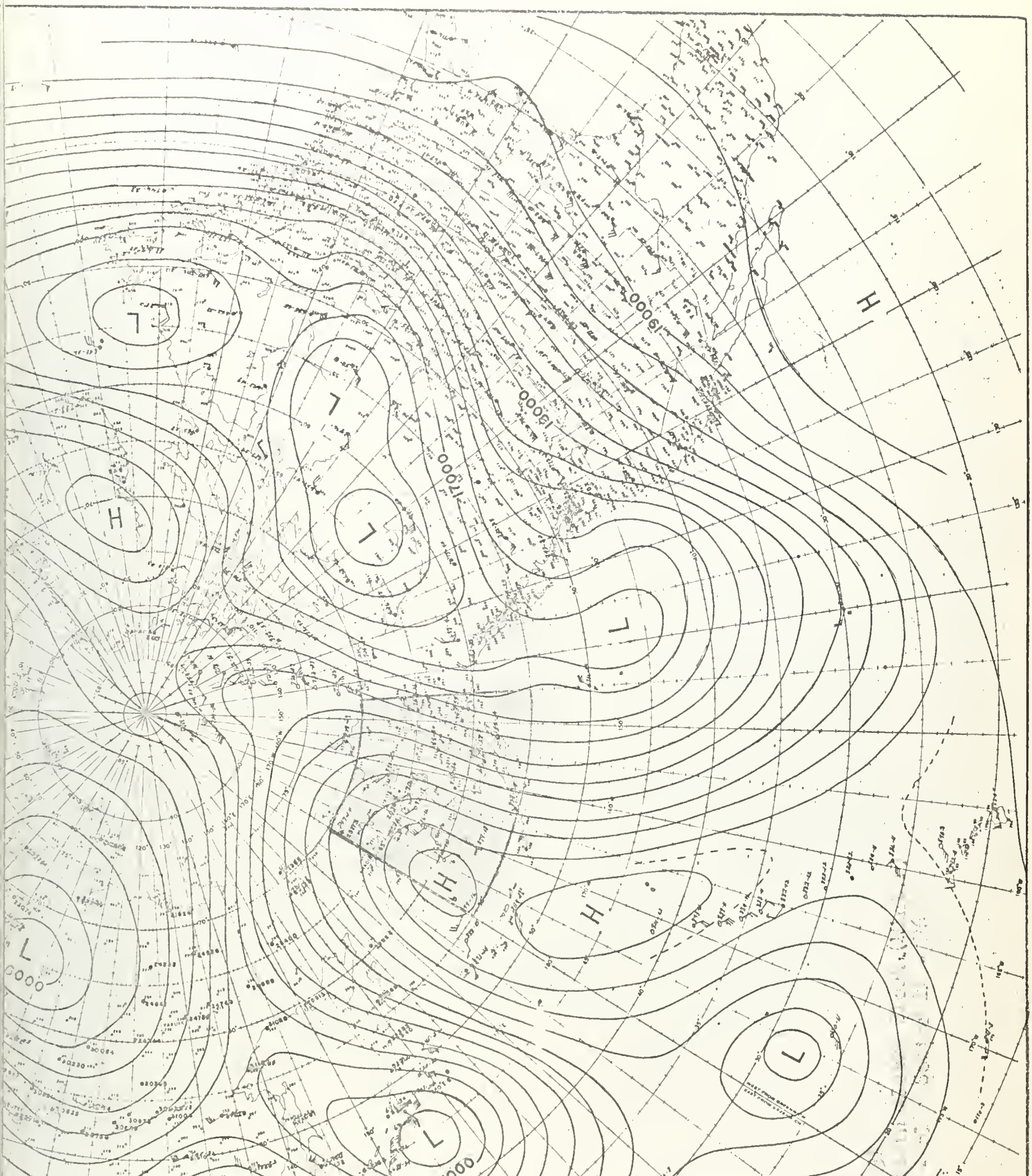


Figure 10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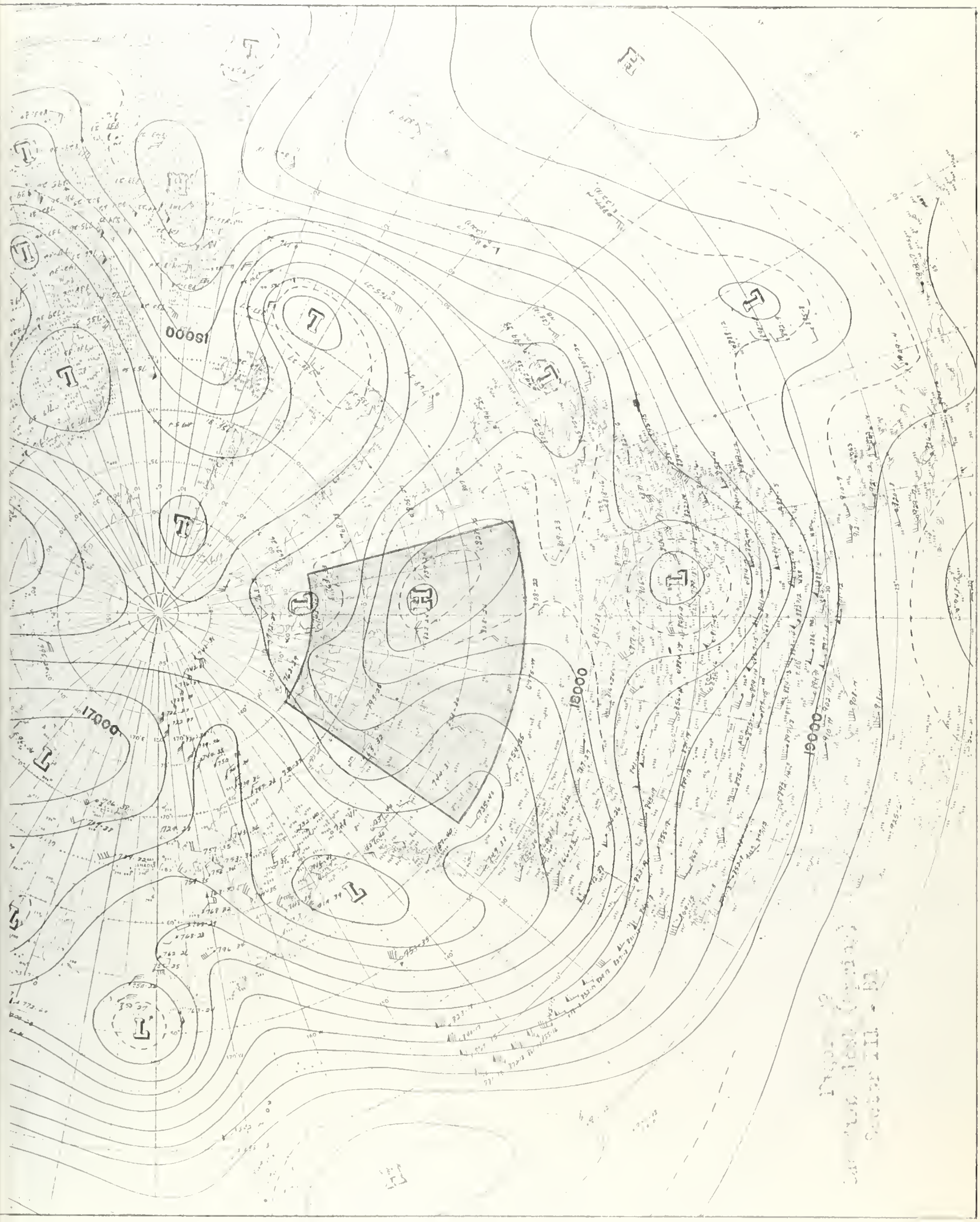
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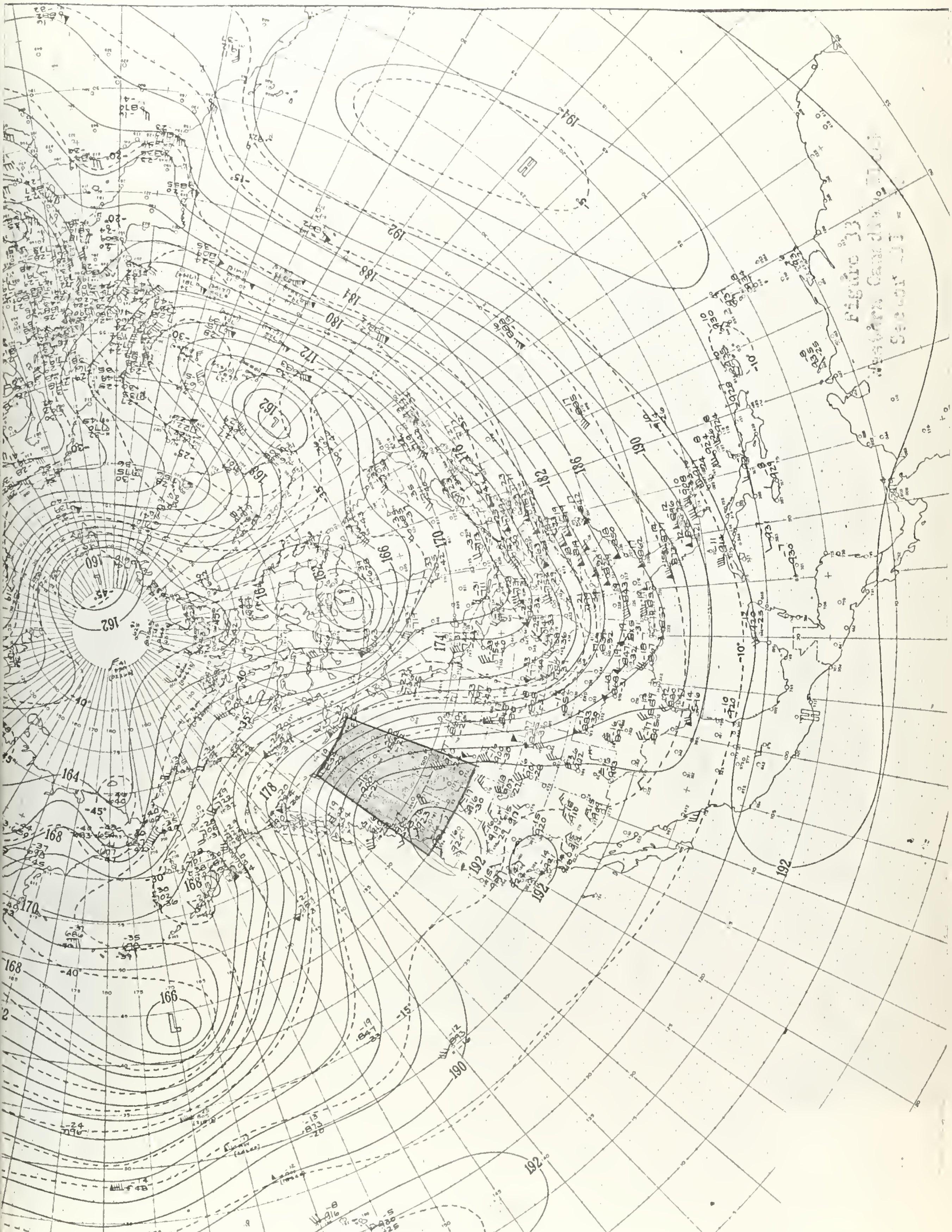

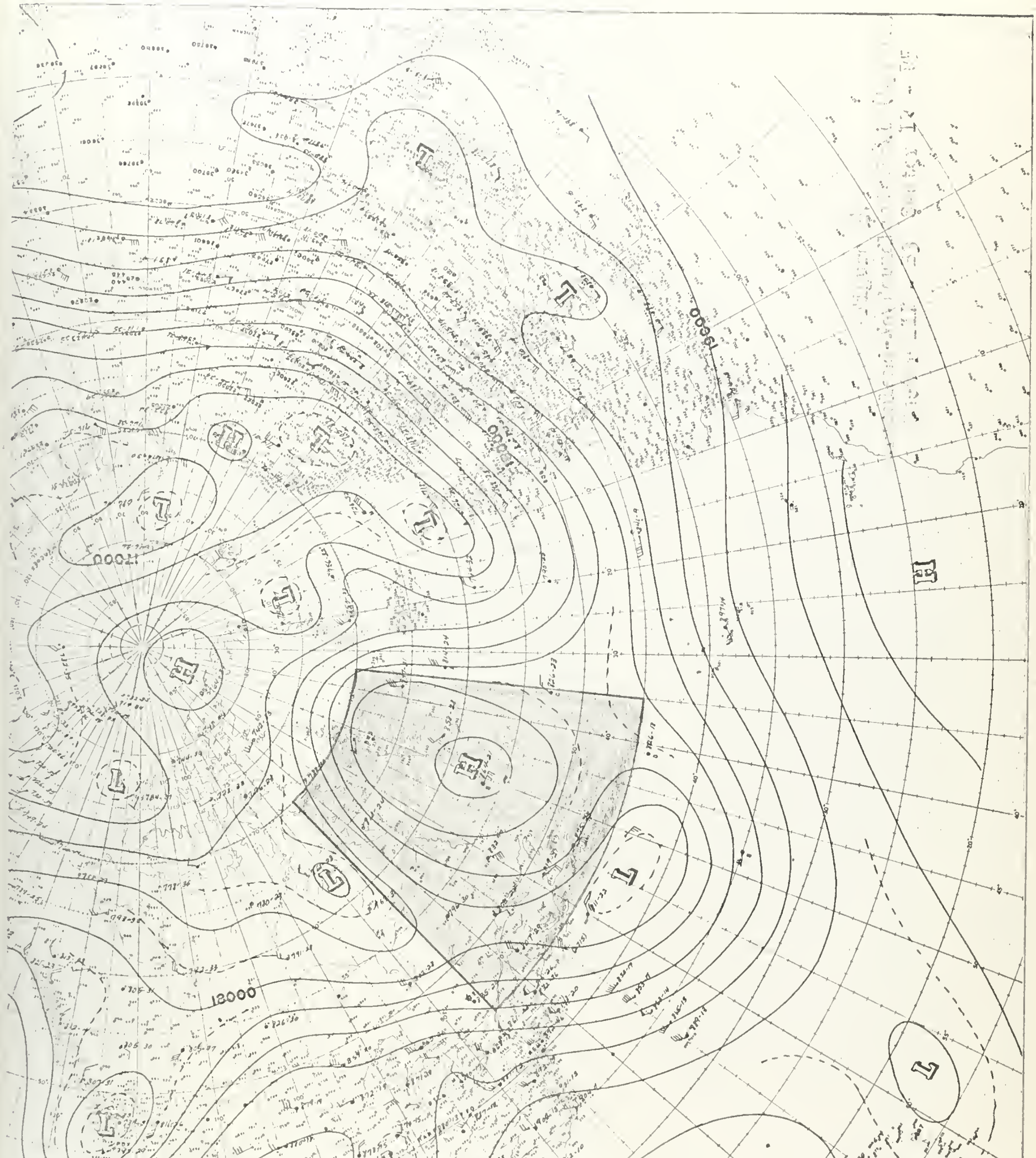
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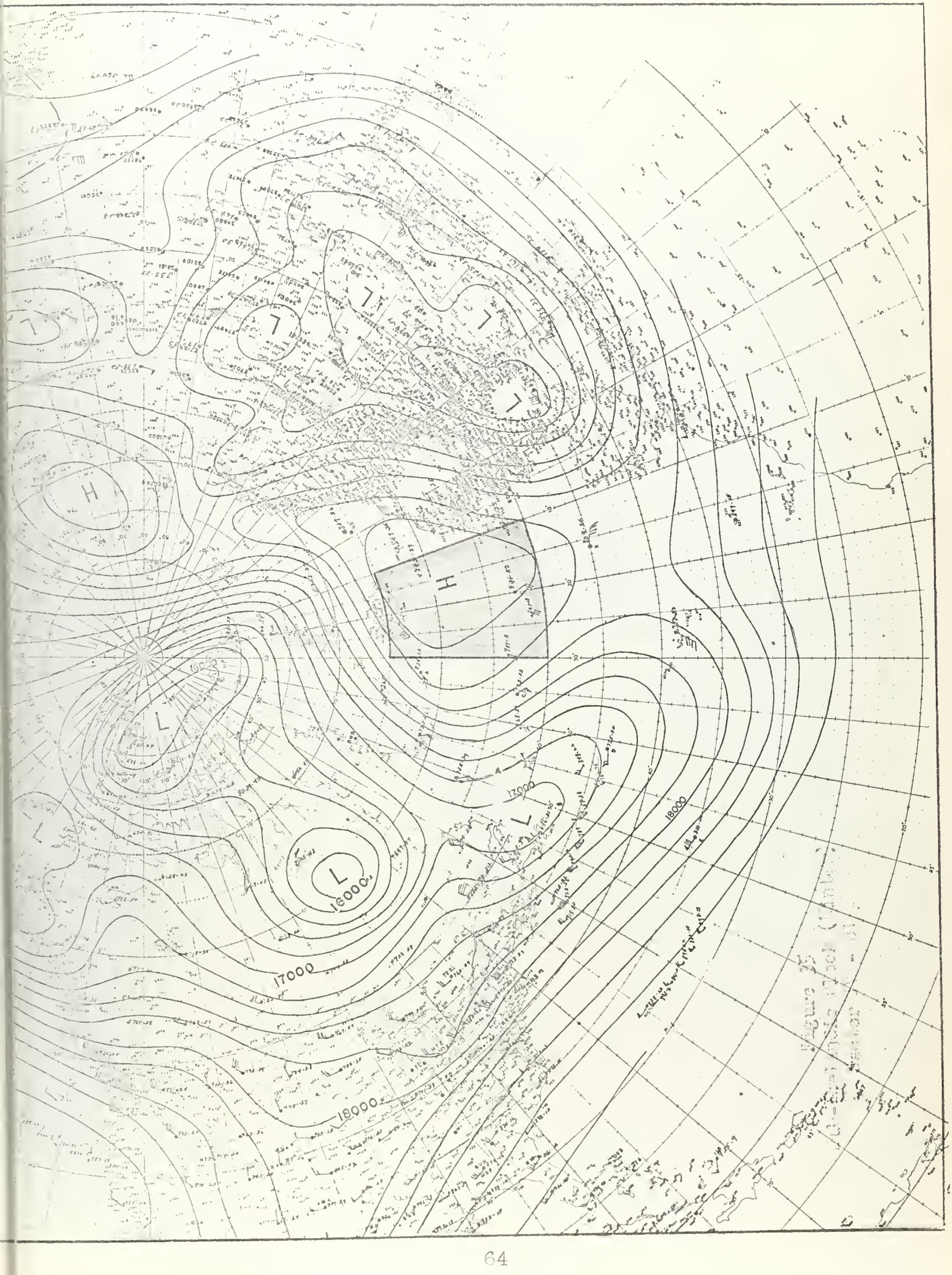
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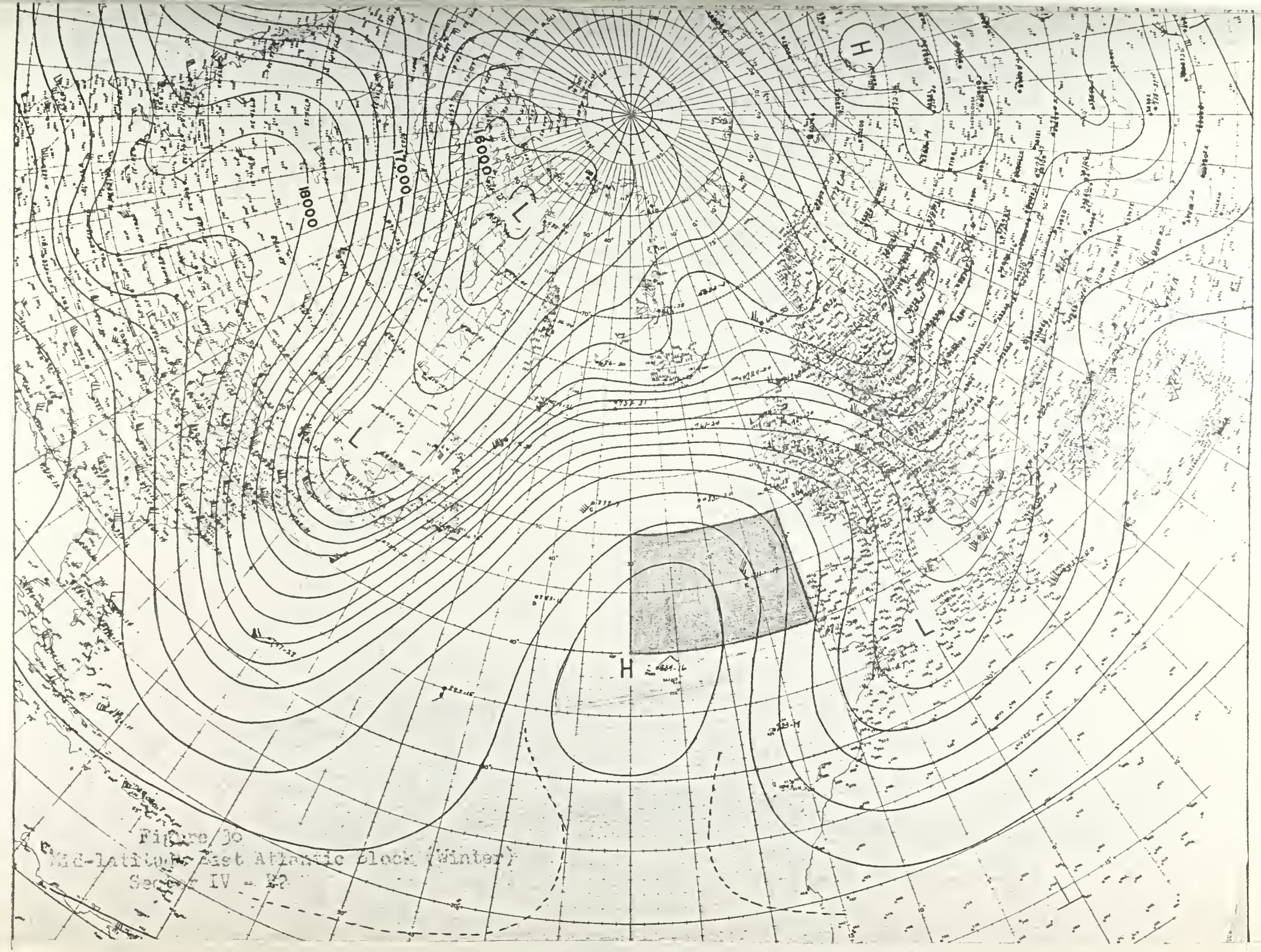
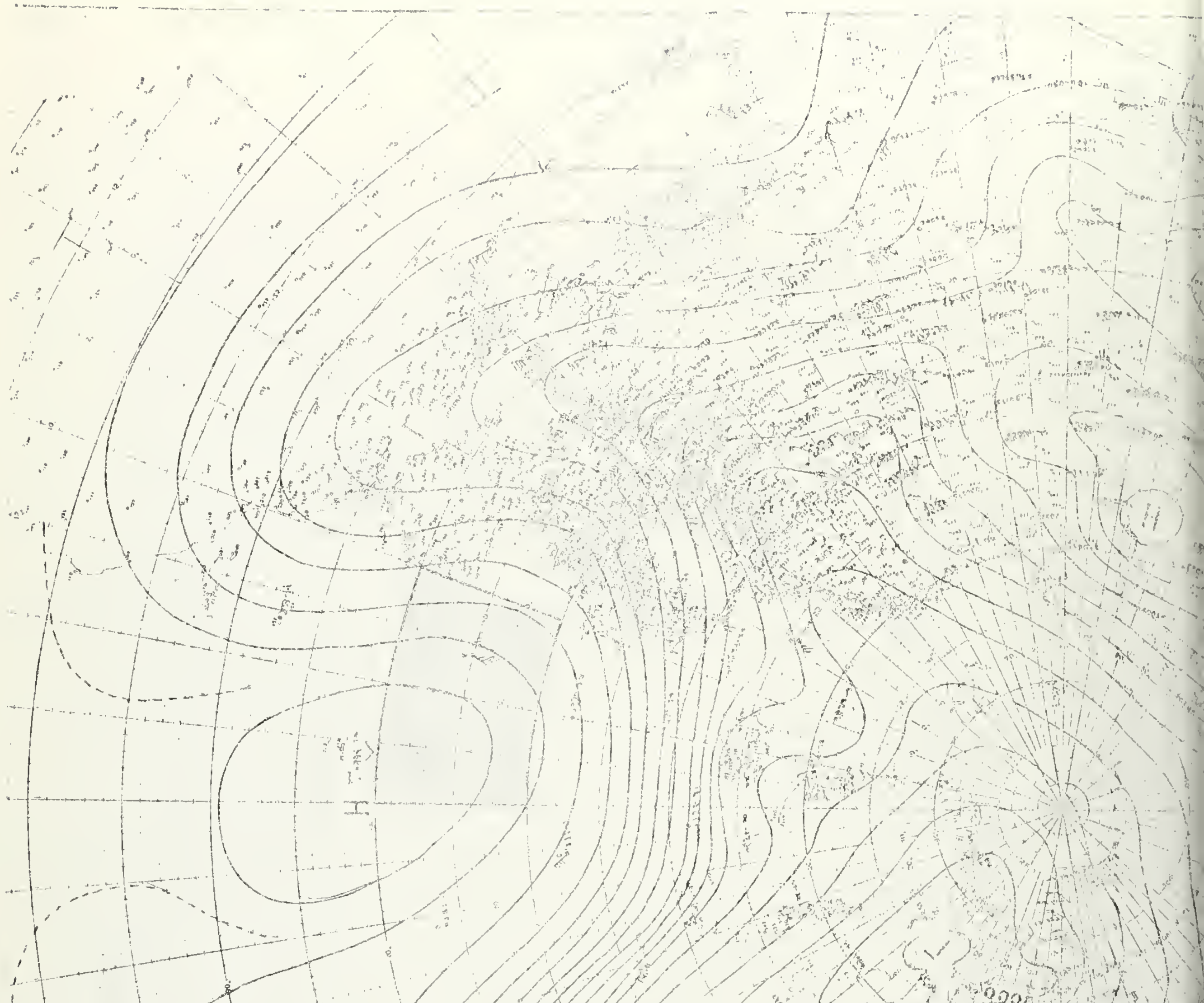
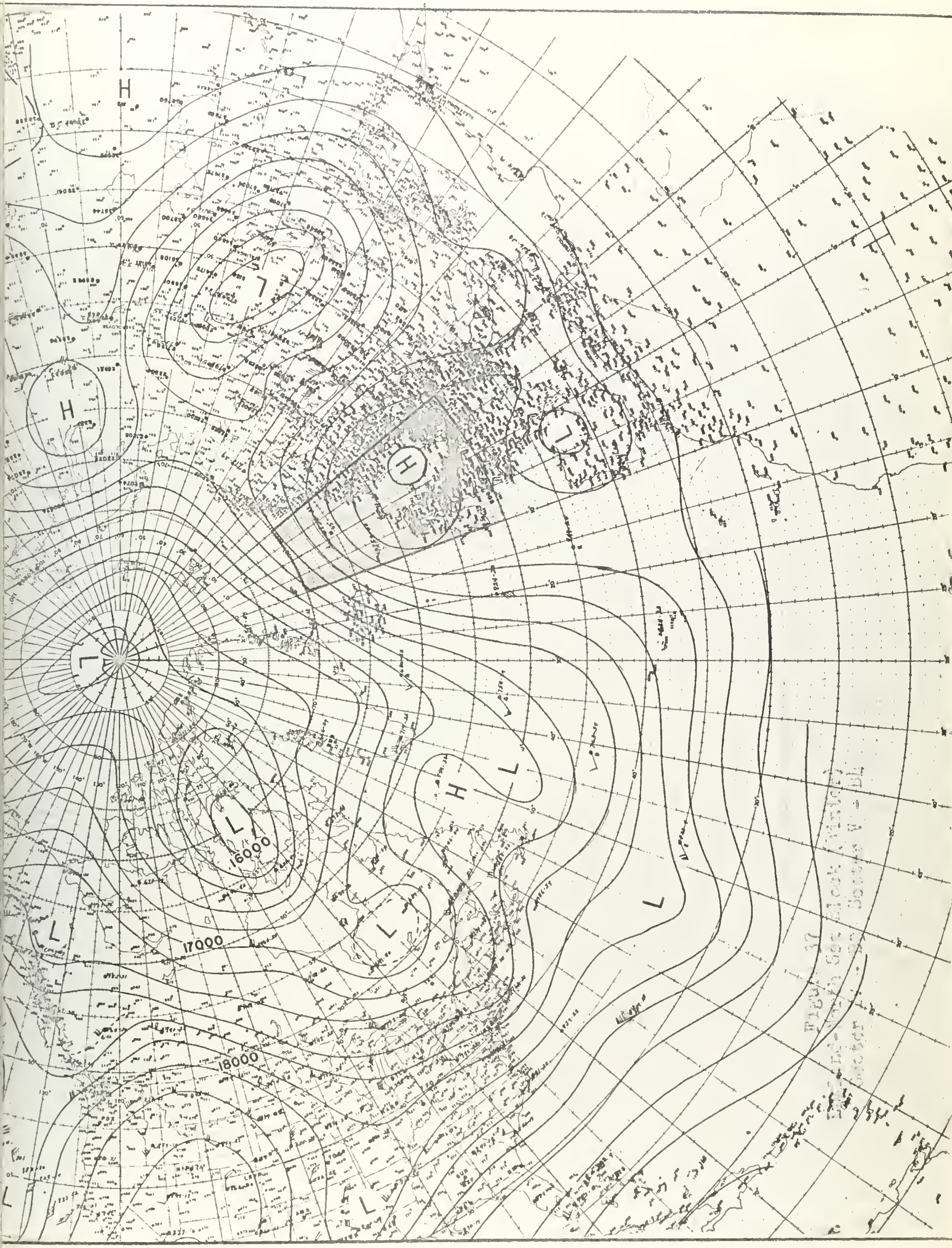


Figure 30
Mid-Latitude East Atlantic Block (Winter)
Sector IV - B2

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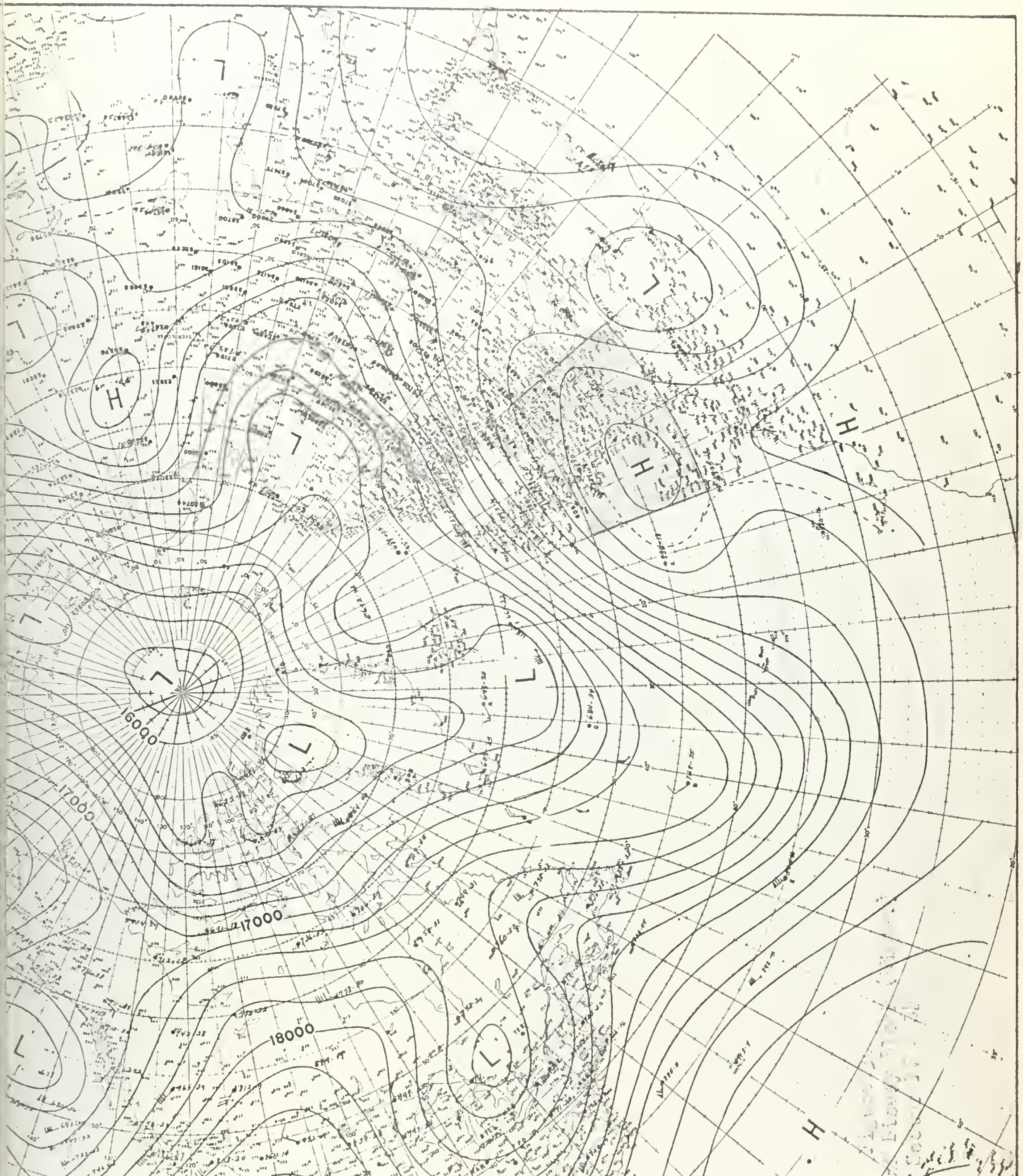
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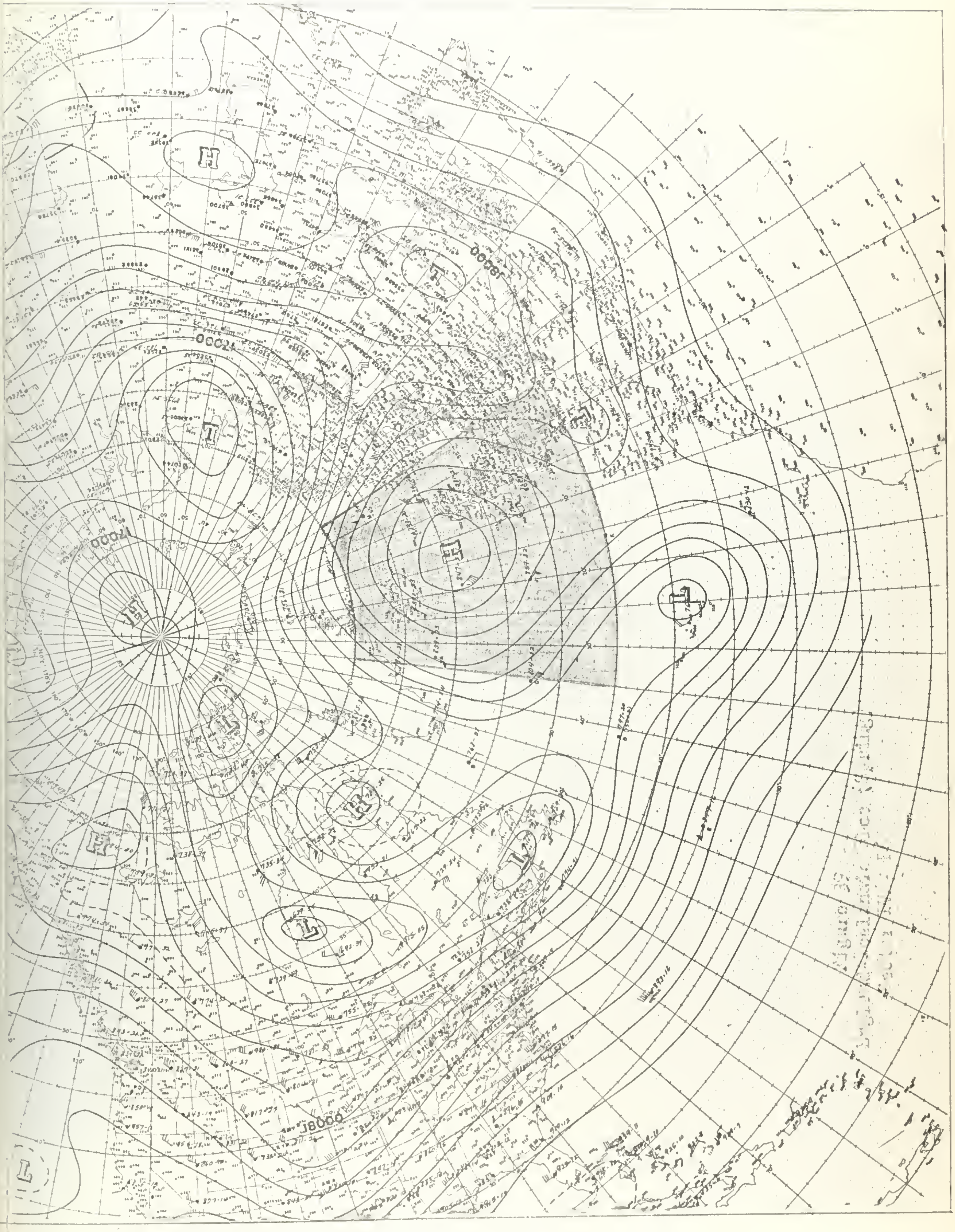
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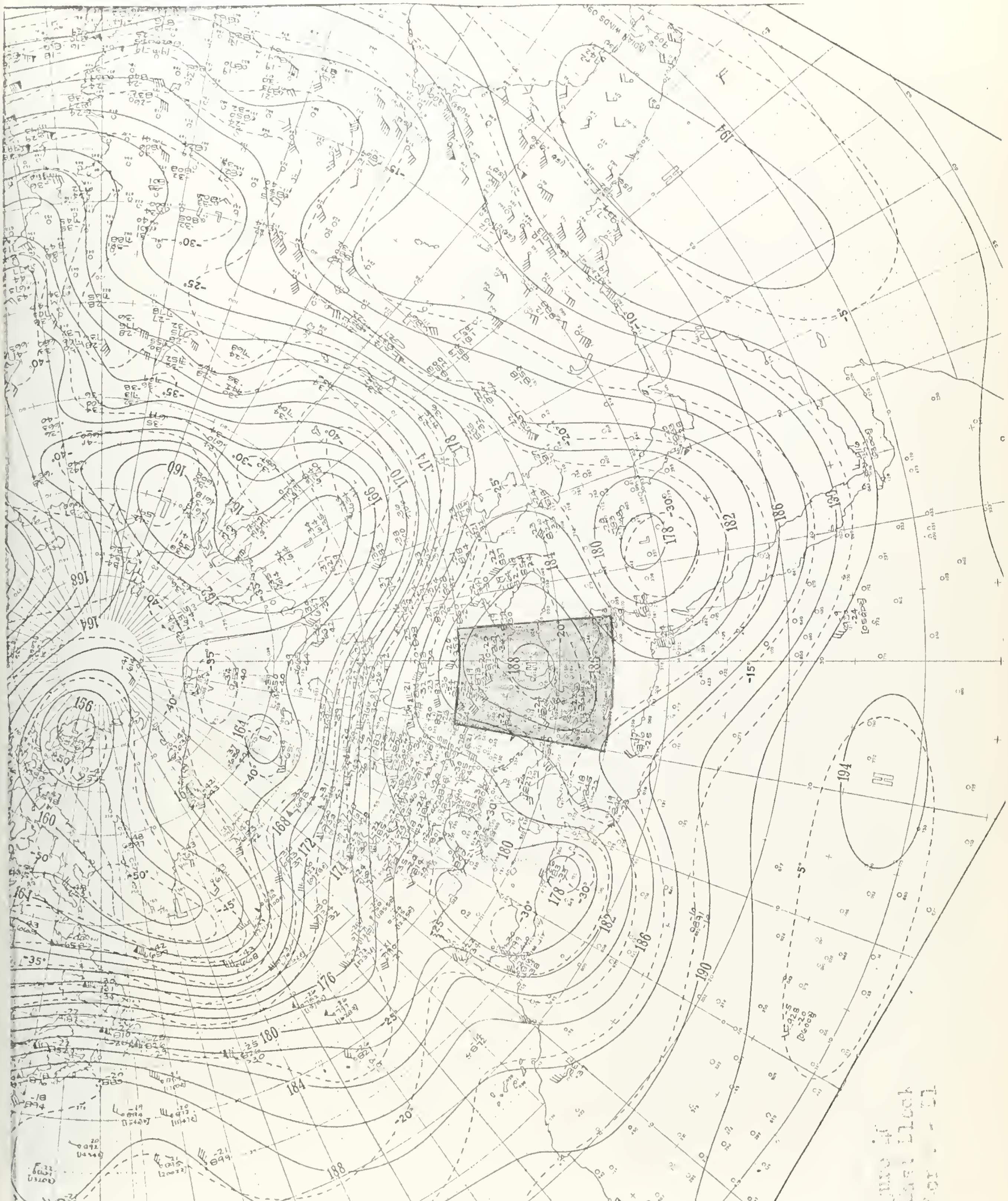


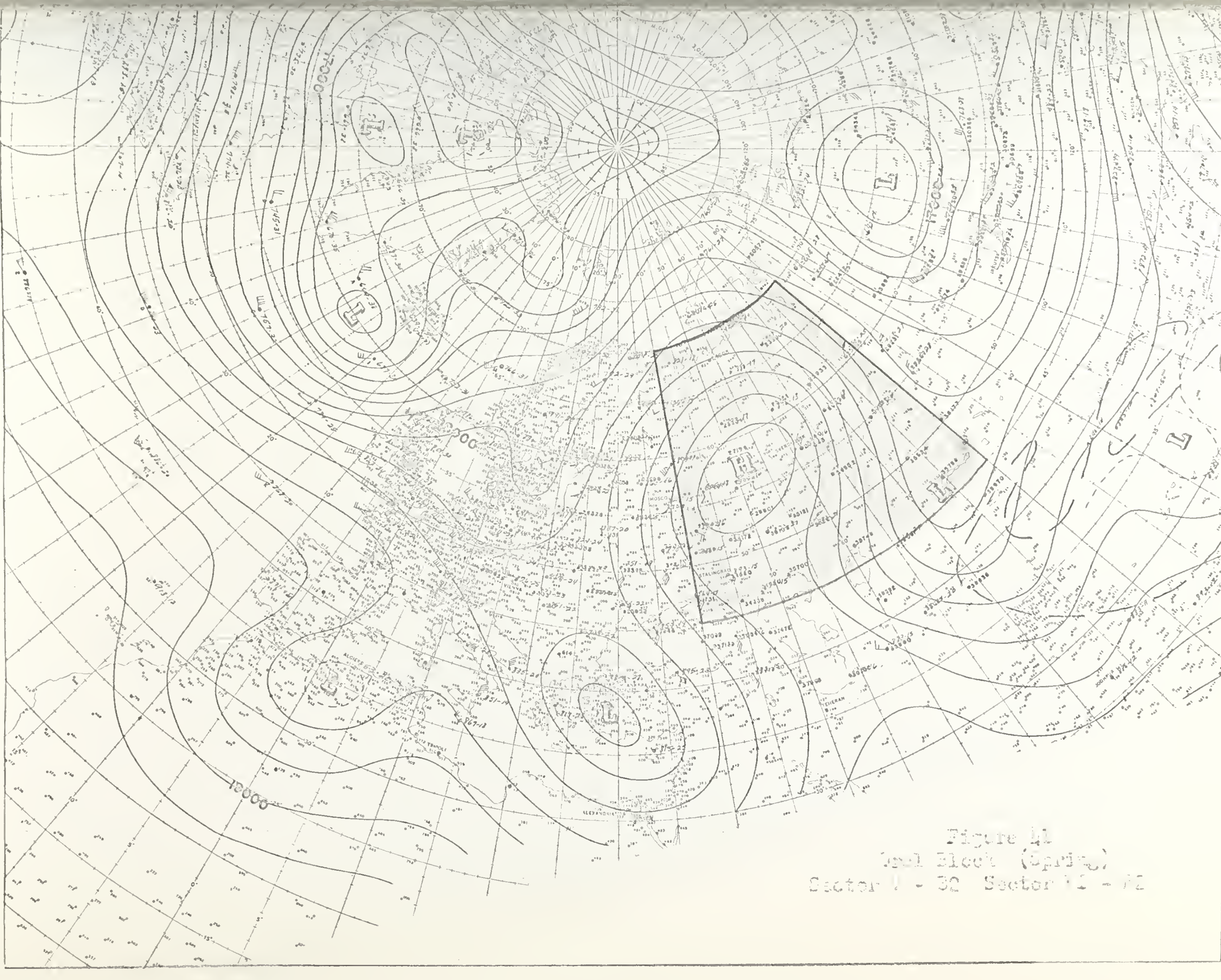
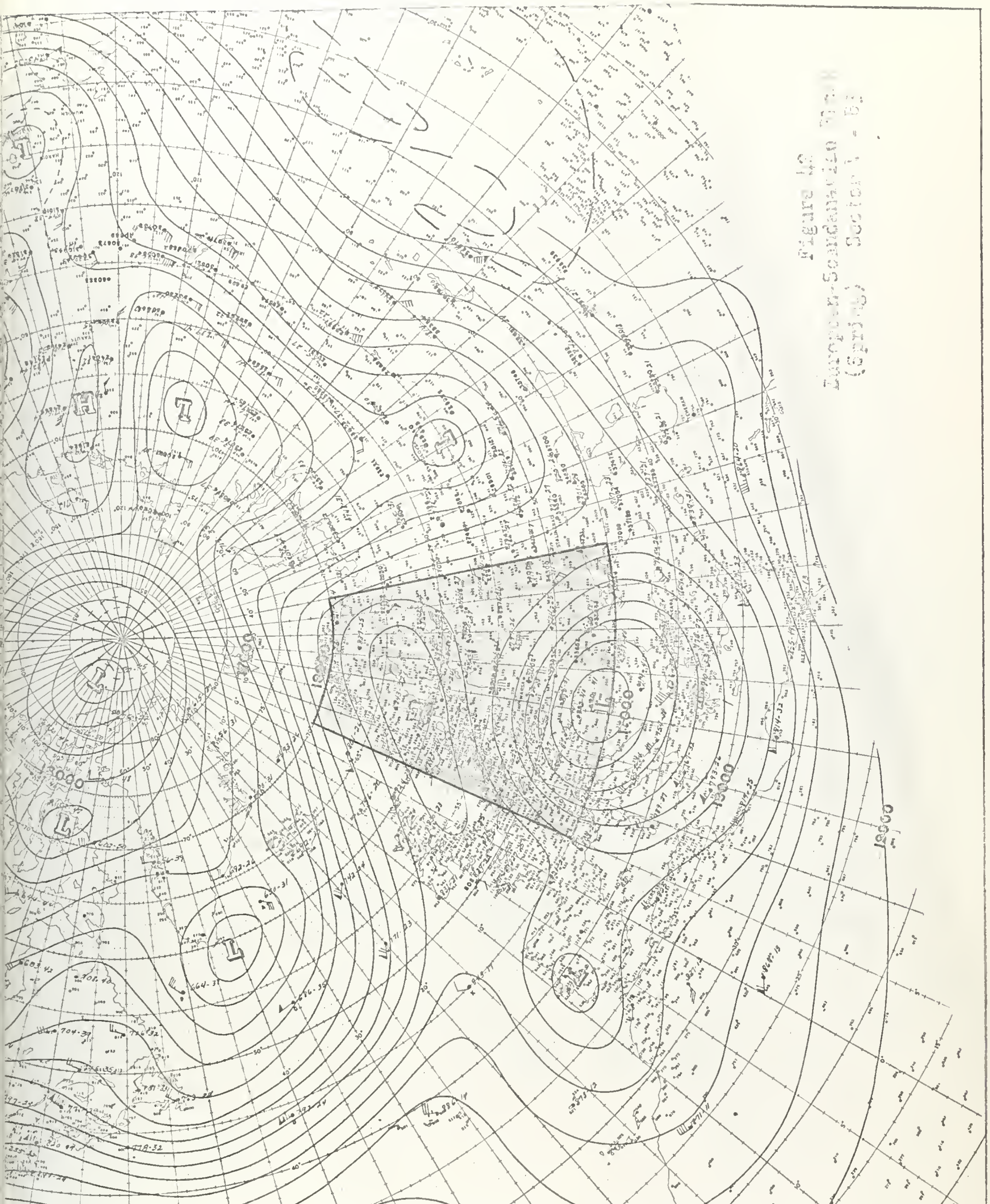
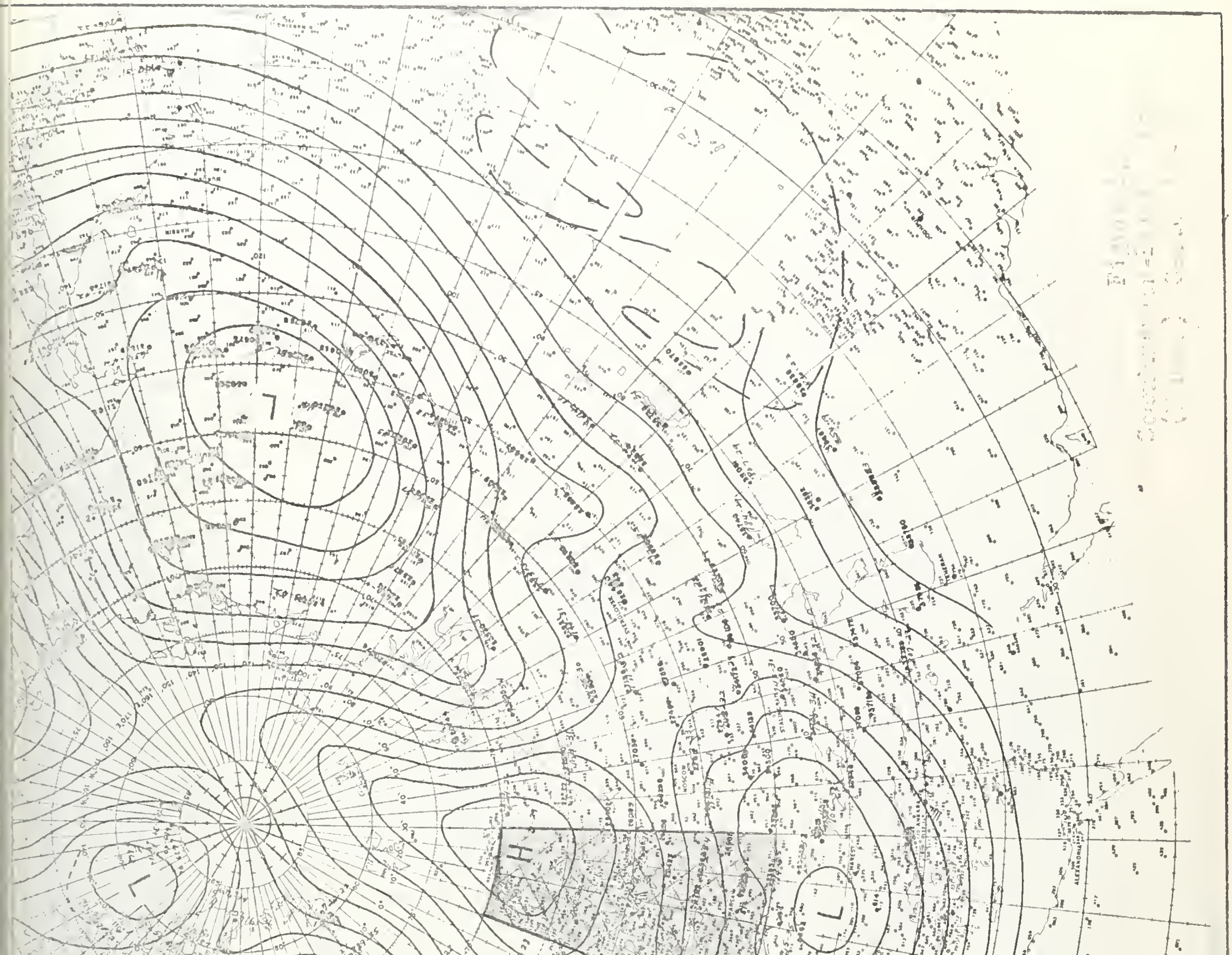
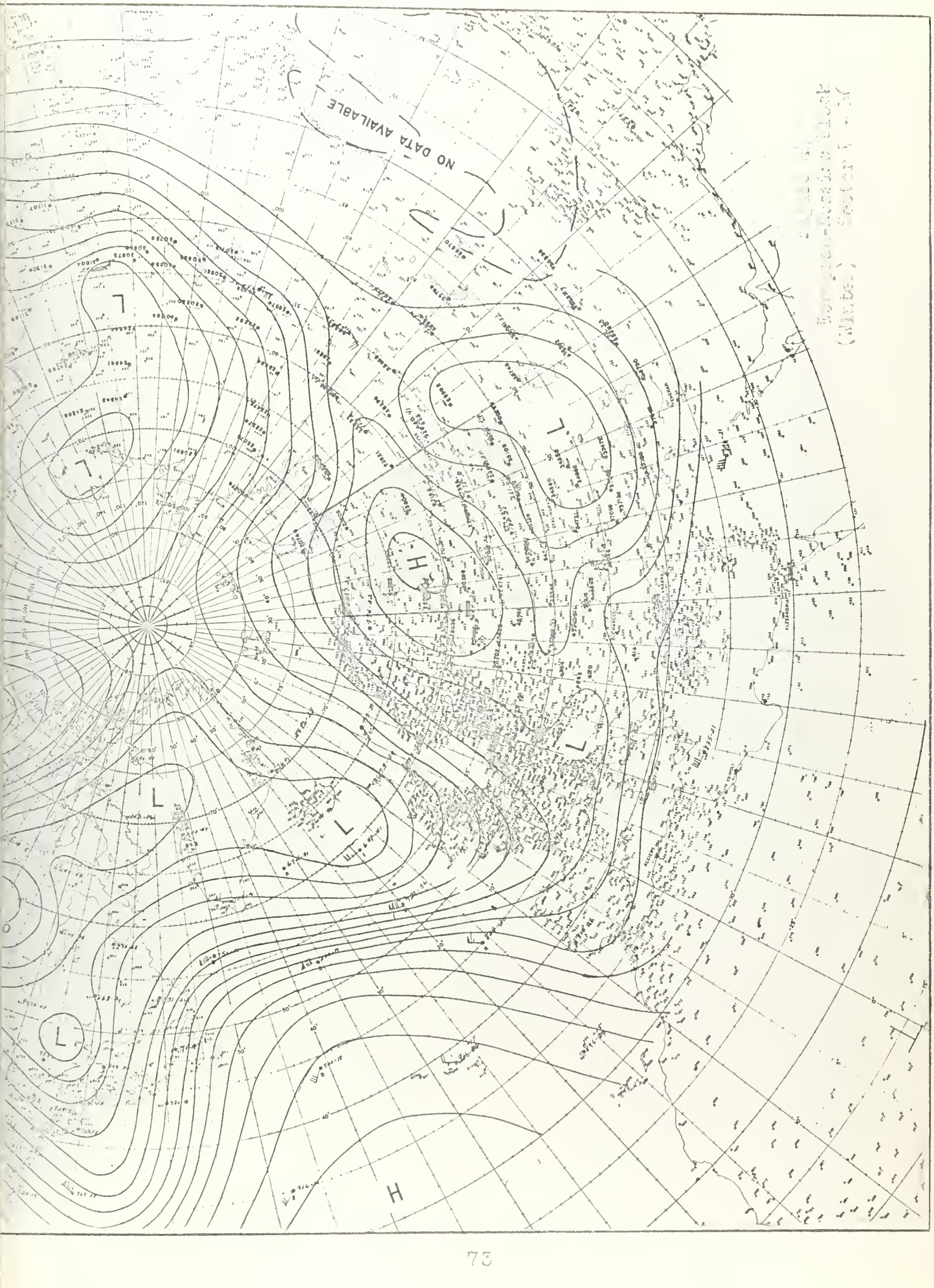


Figure 14
Real Block (Spring)
Sector I - 32 Sector II - 42



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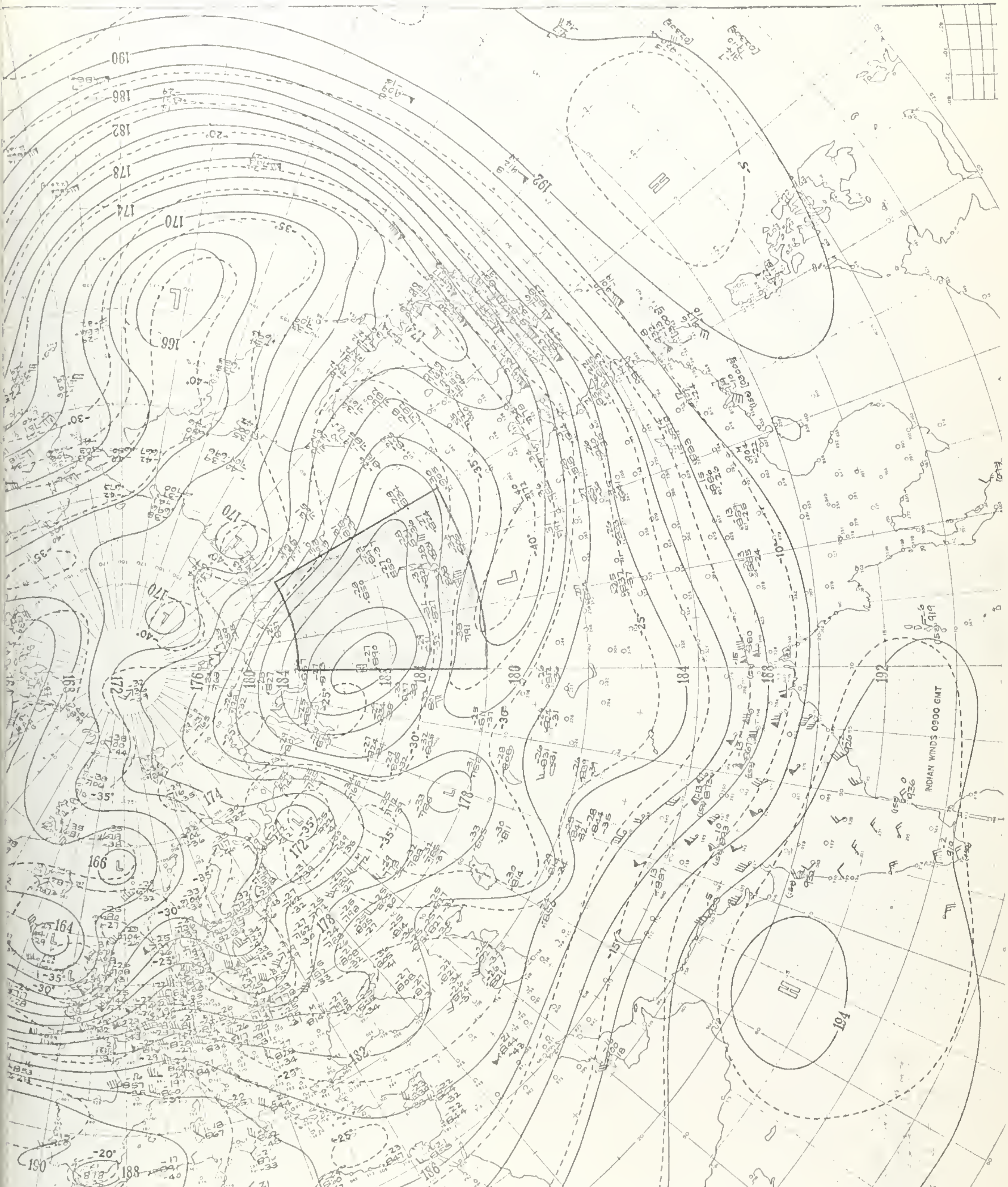
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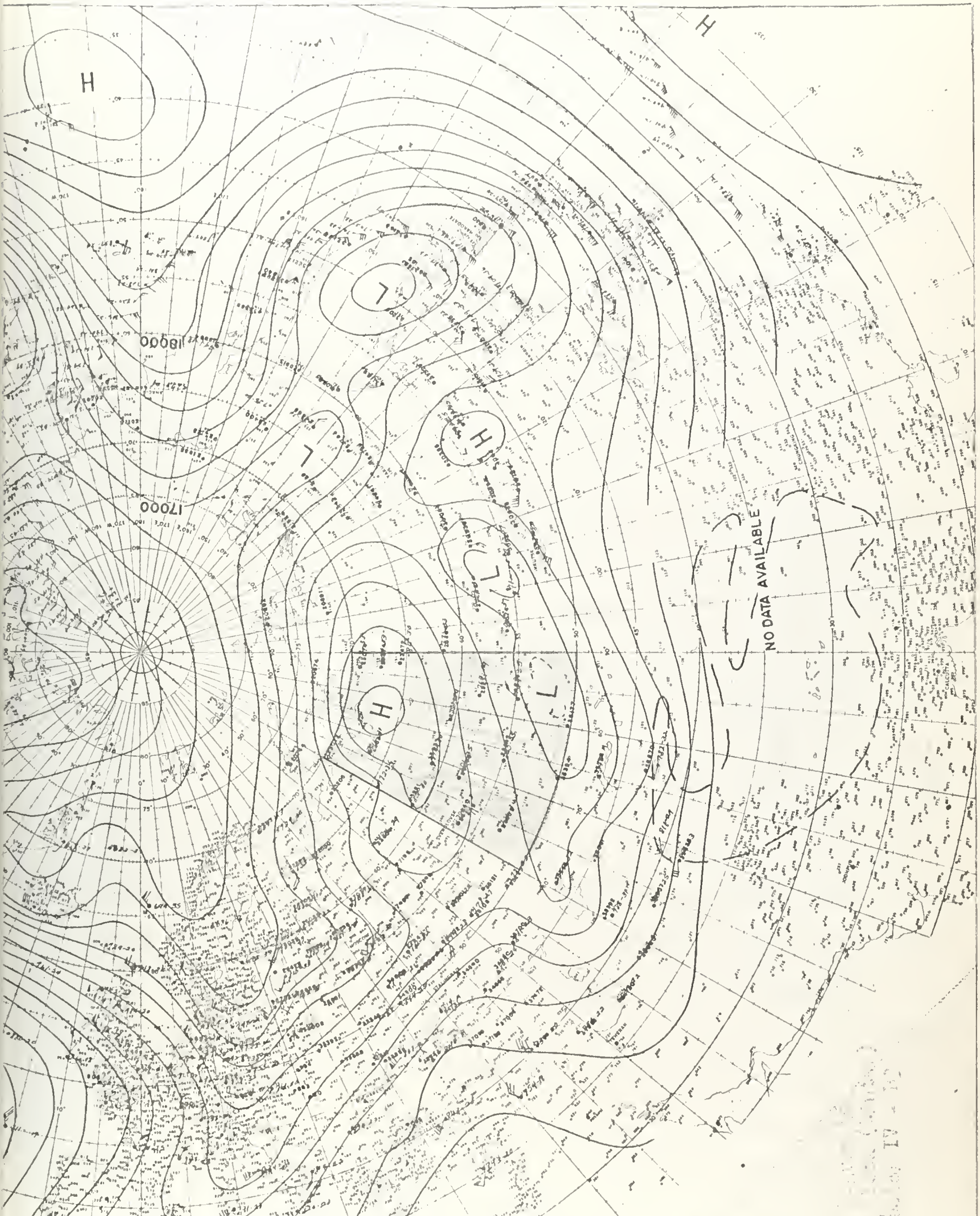
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CHAPTER [illegible]

CONTINGENCY TABLE DEVELOPMENT AND CORRELATION OF WEATHER TYPES

After the weather typing was completed, the results were tabulated in calendar form, (presented in Appendix I), as the raw data input for the Contingency Table Program designed for the CDC-1604 Digital Computer*. Each day's data, consisting of the month, day and year, and the six sector weather types, were placed in a single computer word where the versatility of the 1604 Computor in Logical and Masked Equality Search operations could be utilized to program a contingency table operation.

In the Contingency Table Program, a base sector was correlated against a selected sector with 24 weather types of the base sector cross-correlated against the 24 weather types of the selected sector. Correlations in both space and time were obtained for all six sectors, and in addition, time correlations were computed from the base day plus one to base day plus seven days in advance. The use of the word "correlation" does not imply correlation factor in this thesis, but does connote the systematic connection and occurrence of various weather types. The actual print out of the contingency tables, Appendix II, lists the operational parameters in the heading of each table. Each weather type in both the base and selected sector has an associated total number (the right-hand column and the lower row) which is the total occurrence of a particular weather type

*Program is on file at the Computation Center, U.S.Naval Postgraduate School.

in a selected correlation. The total number of cases used in the development of each table is the number ([illegible] or 4[illegible]8) located in the lower right hand corner of the table. The letter/number combinations across the top and down the left-hand side are the weather-type designations. In computer operation, these letter/number combinations were replaced by octal numbers 1 through 30 consecutively.

The Contingency Table Program was designed to handle 24 weather types, with a total column, total row, and a "total cases" per table all being presented. Additional refinements to the weather-typing procedure, after the computer had processed the data, reduced the number of weather types utilized in this system to 23 types in any sector with Sectors I, III, and VI listing only 20 weather types due to their limited blocking activity.

To determine the frequency distribution or summary of weather types for any sector, merely enter the space correlation tables with the base sector equal to the selected sector. Figures 47-52 clearly substantiate previous empirical observations, such as predominant blocking in the eastern ocean areas of the Northern Hemisphere, or zonal flow at the 500-mb surface over the Asian Continent and Western Pacific Ocean. These results, figures 47-52, support the choice of <u>six</u> sectors, in that the Northern Hemisphere has been separated into sectors according to the weather type (zonal, meridional or block) that dominates each sector.

This system of 500-mb weather typing is based upon the stability of blocking systems at 500 mb. This stability is readily apparent if we compute the average life cycle of a blocking series in the Northern Hemisphere and similarily the life cycle for each sector. The results, depicted by figures 53 and 54, are significant in that the average life cycle of a blocking series in Sectors II and IV is 10 days, and not the 5-7 day average previously accepted. Not only are Sectors II and IV the dominant blocking sectors of the Northern Hemisphere, but the persistence of a blocking series in these sectors exceeds that of any other sector. From these observations, we have concluded that Sectors II and IV are the most stable sectors of the Northern Hemisphere; therefore, the best results from the contingency tables should be achieved from these two sectors with decreasing reliability as the blocking dominance of a sector decreases. Additional analysis was performed on the blocking sectors to aid in determining the flow (zonal, meridional, or blocking) in adjoining sectors. Figures 55 and 56 show the probability of a block occurring in Sector II or Sector IV with a given basic weather type occurring in any one of the other six sectors. A summary of figures 55 and 56 follows:

1. When meridional flow occurs in Sector I, there is a 74% probability of blocking action in Sector II.

2. When meridional flow occurs in Sector III, there is a 73% probability of blocking action in Sector IV.

3. Meridional flow generally precedes any blocking type in the Northern Hemisphere.

4. When zonal flow exists in Sector III or Sector V, the probability of a block occurring in Sector II or Sector IV is 65% and 77%, respectively.

5. Although Sector VI is predominantly a zonal sector, if a block does occur in Sector VI, the probability of blocking action in Sector IV is 84%.

6. While meridional flow in Sector I formed a basis for blocking weather types in Sector II, zonal flow in Sector I indicates a 70% probability of a blocking weather type existing in Sector IV.

To exhibit the usefulness and simplicity of the contingency tables, an example problem will be presented utilizing data from the Historical Weather Series, figure 57, March 9, 1951. In this problem, we will assume that Sectors I, II, and III, have been typed as follows: type M11 in Sector I, type B5 in Sector II, type M6 in Sector III. Utilizing this information in conjunction with the contingency tables, the weather patterns of the 500-mb surface for Sectors IV, V, and VI will be prognosticated for March 9, 1951. For easy reference, extracts from the contingency tables for the given weather types of Sectors I, II, and III, are presented in Table 2, page 93. Correlating Sectors I, II, and III against Sector IV and combining the three tables indicates a type B5 block should exist in Sector IV with the flow pattern that already exists in Sectors I, II, and III. Similiar operations with the contingency tables for Sector V and Sector VI indicate split flow (type Z4) or complex meridional flow (type M12 or M13 for Sector V and

a split flow (type [illegible]) or flow centered at 40° latitude ([illegible]) for sector VI. Reference to the 500-mb surface for March 9, 1951, figure 58, reveals a weather pattern clearly compatible with that determined by the contingency tables. Time correlations can be constructed in a similar manner. It is readily clear that multiple correlations should always be used whenever possible as this forms the basis for a particular sequence of weather types from which the correlation tables were derived.

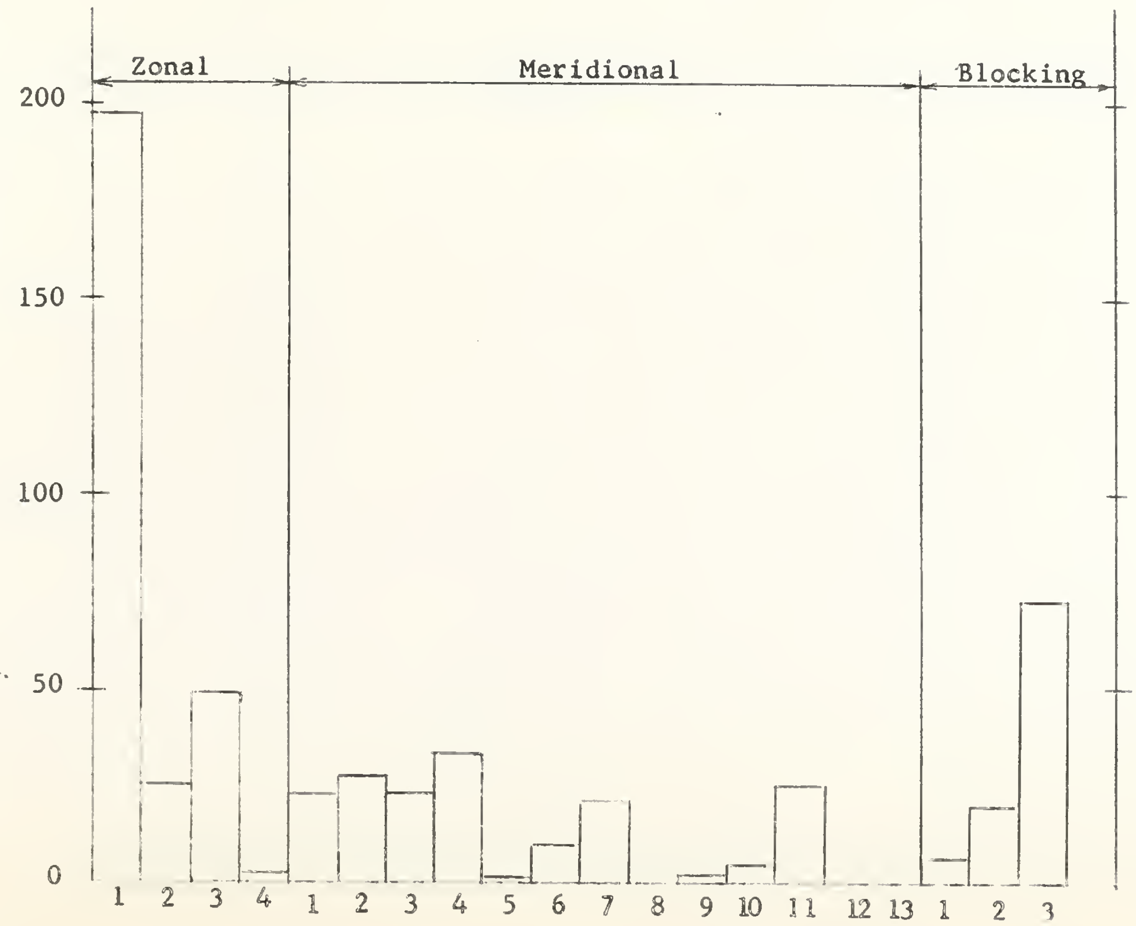
The contingency tables for time correlations can also be used to estimate the life cycle of a selected 500-mb weather type by increasing the time correlation in increments of one day until persistence of the selected weather type is no longer valid. As this persistence decreases, the modification of the selected weather type can also be observed. (The complete set of contingency tables are not included in the thesis, but are available from the U. S. Naval Postgraduate School, Monterey, California.)

A cross-correlation between the tabulated calendar, Appendix I, and the contingency tables, Appendix II, is presented in Table II as an additional aid in contingency-table utilization.

Due to the time limitation an extensive analysis of the many combinations and operations using the contingency-tables was impossible except for the broad analysis accomplished with the blocking sectors.

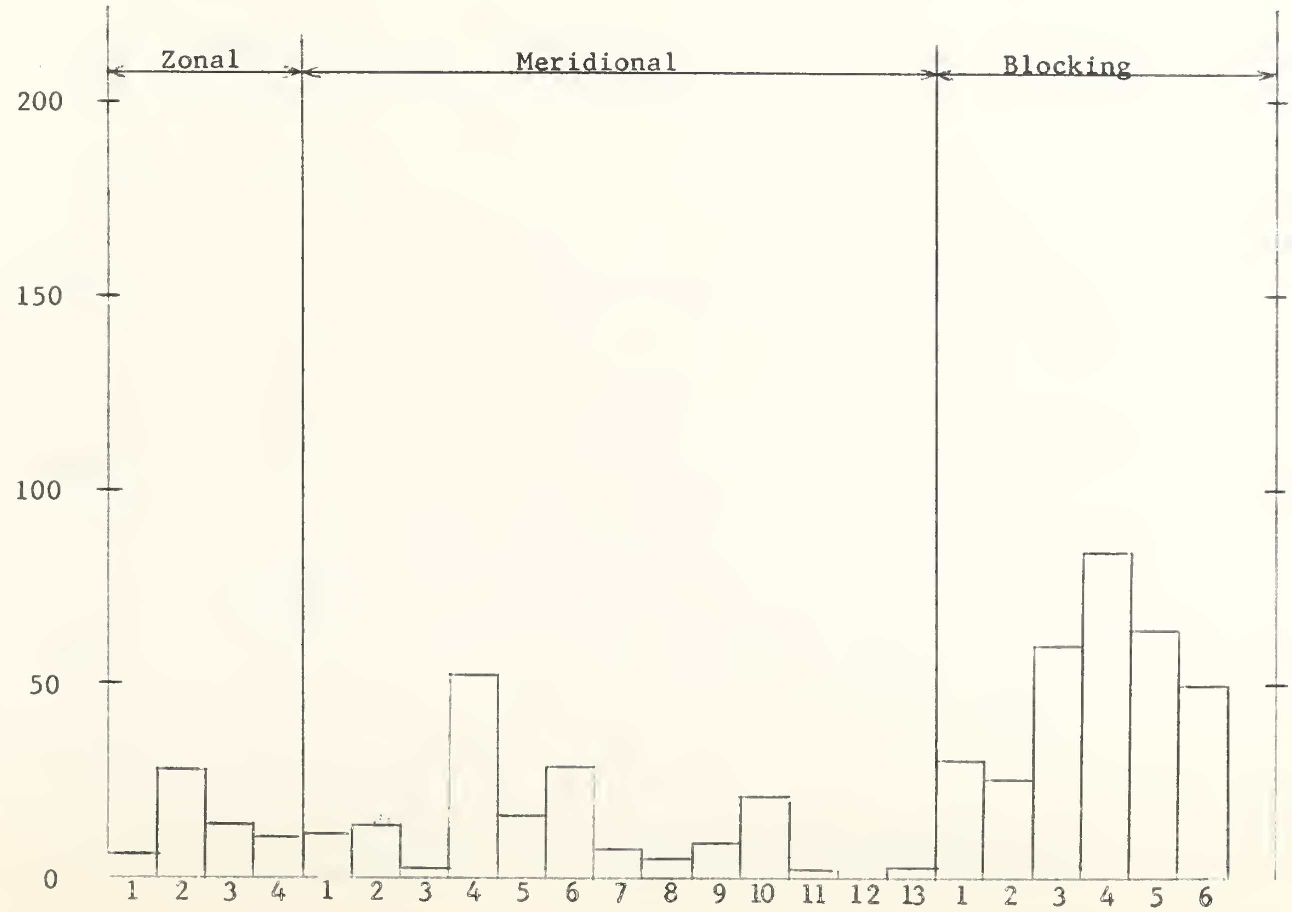
Sector I   Summary of Weather Types

Total Zonal Types	275
Total Meridional Types	162
Total Blocking Types	105



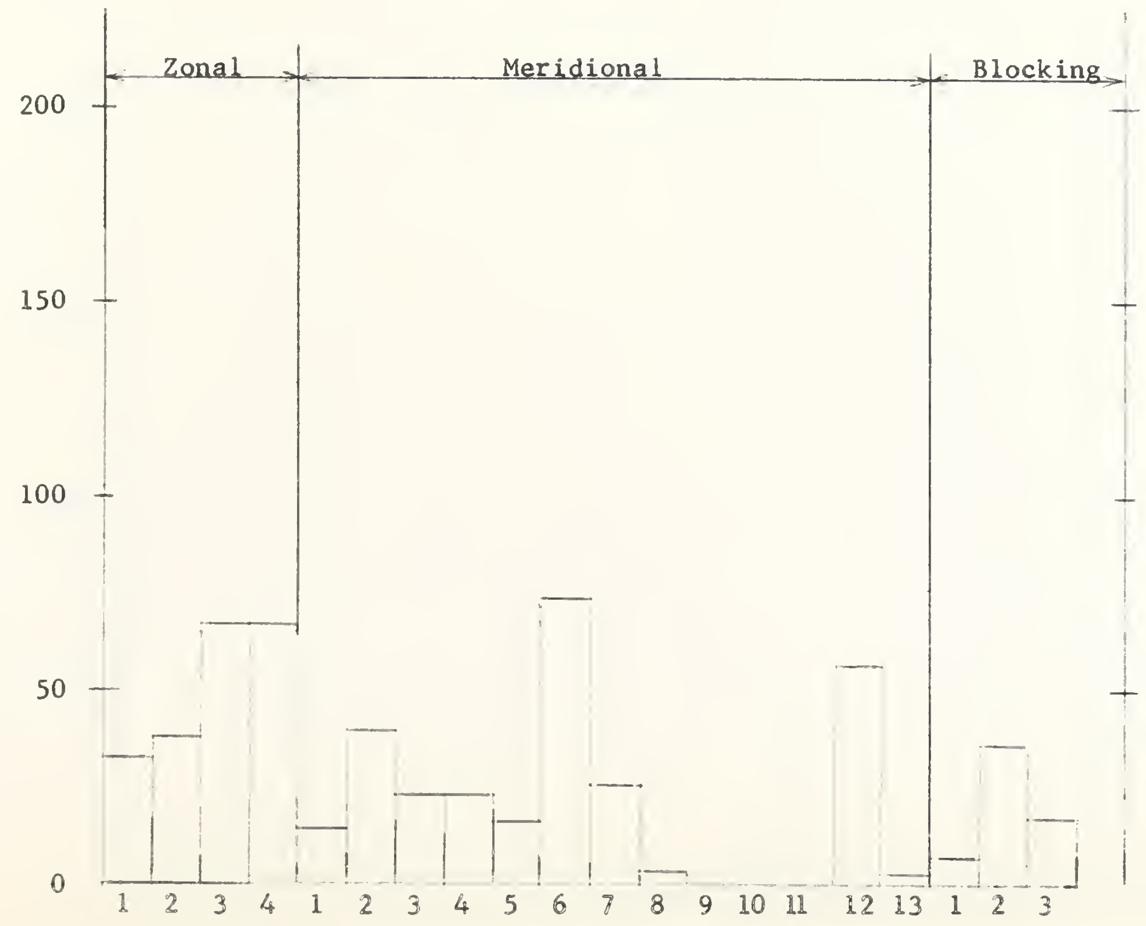
Sector II   Summary of Weather Types

Total Zonal Types	59
Total Meridional Types	170
Total Blocking Types	313



Sector III Summary of Weather Types

Total Zonal Types	203
Total Meridional Types	270
Total Blocking Types	59

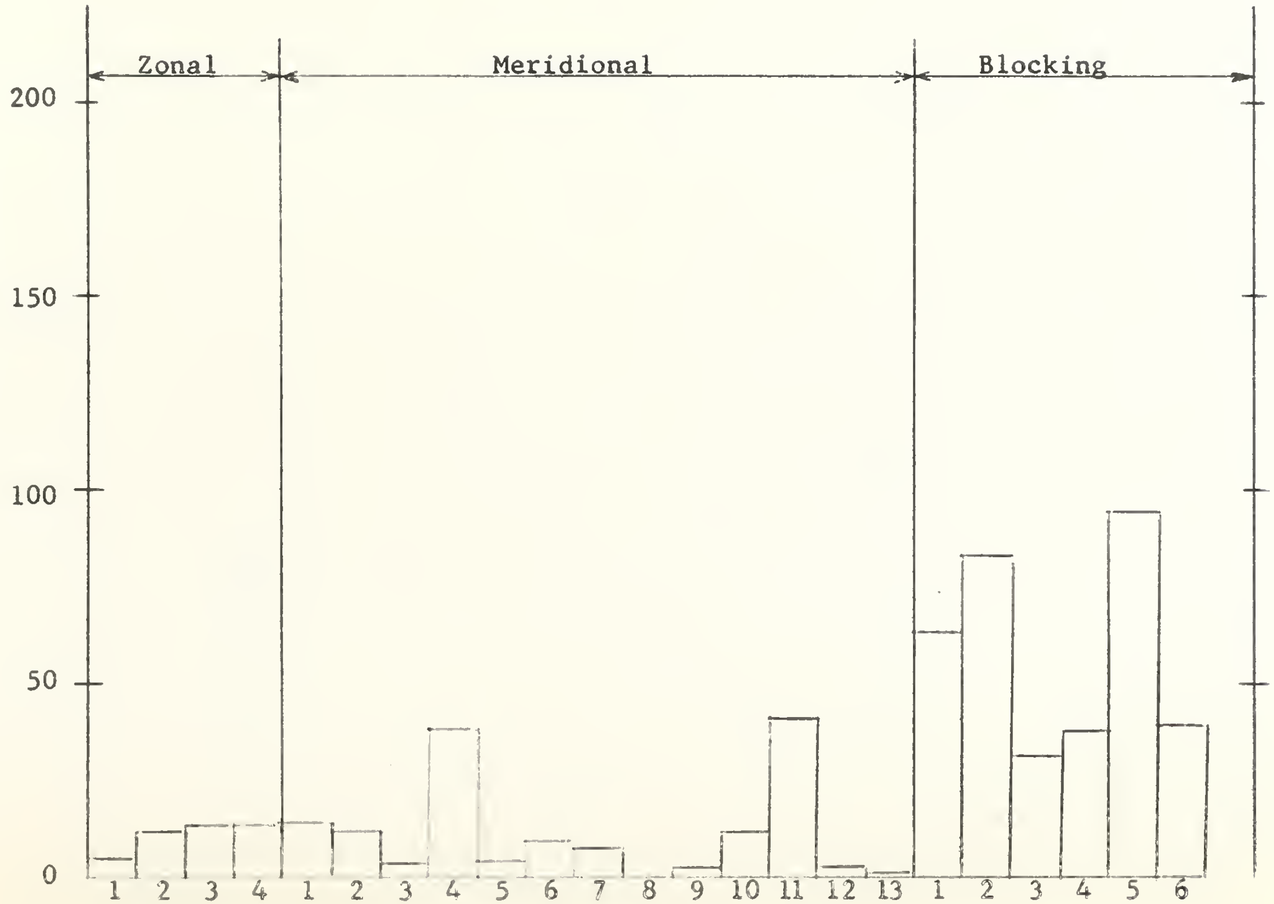


Sector IV   Summary of Weather Types

Total Zonal Types   41

Total Meridional Types   150

Total Blocking Types   351

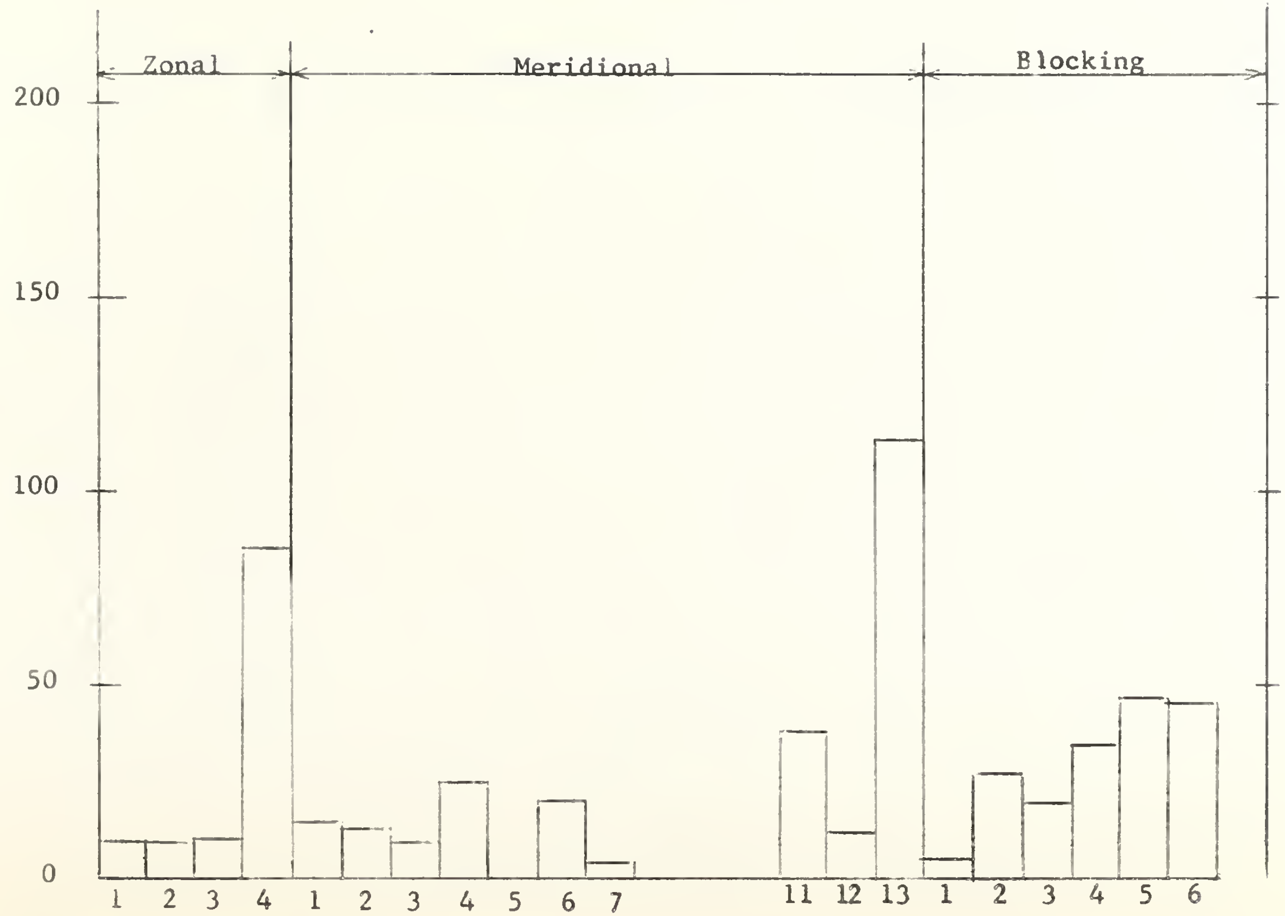


SECTOR V   Summary of Weather Types

Total Zonal Types 113

Total Meridional Types 250

Total Blocking Types 179

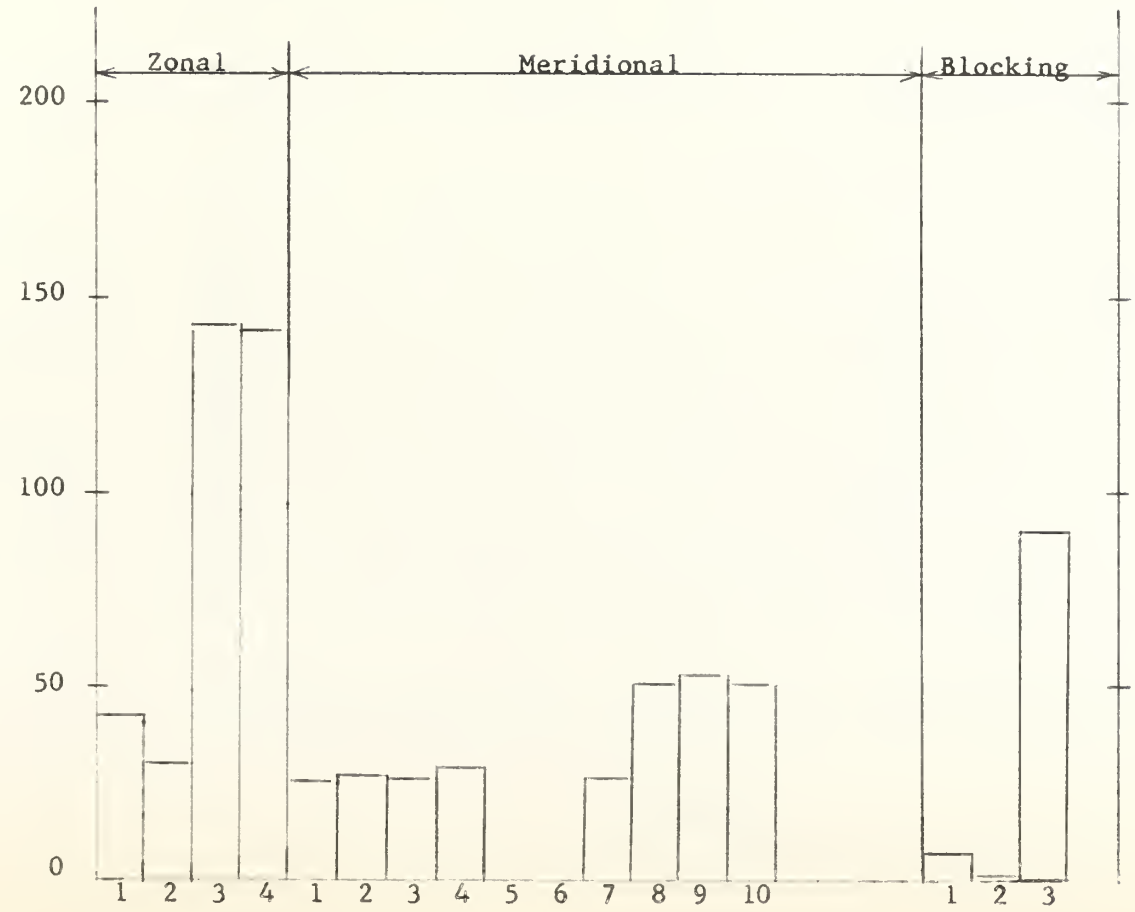


SECTOR VI SUMMARY OF WEATHER TYPES

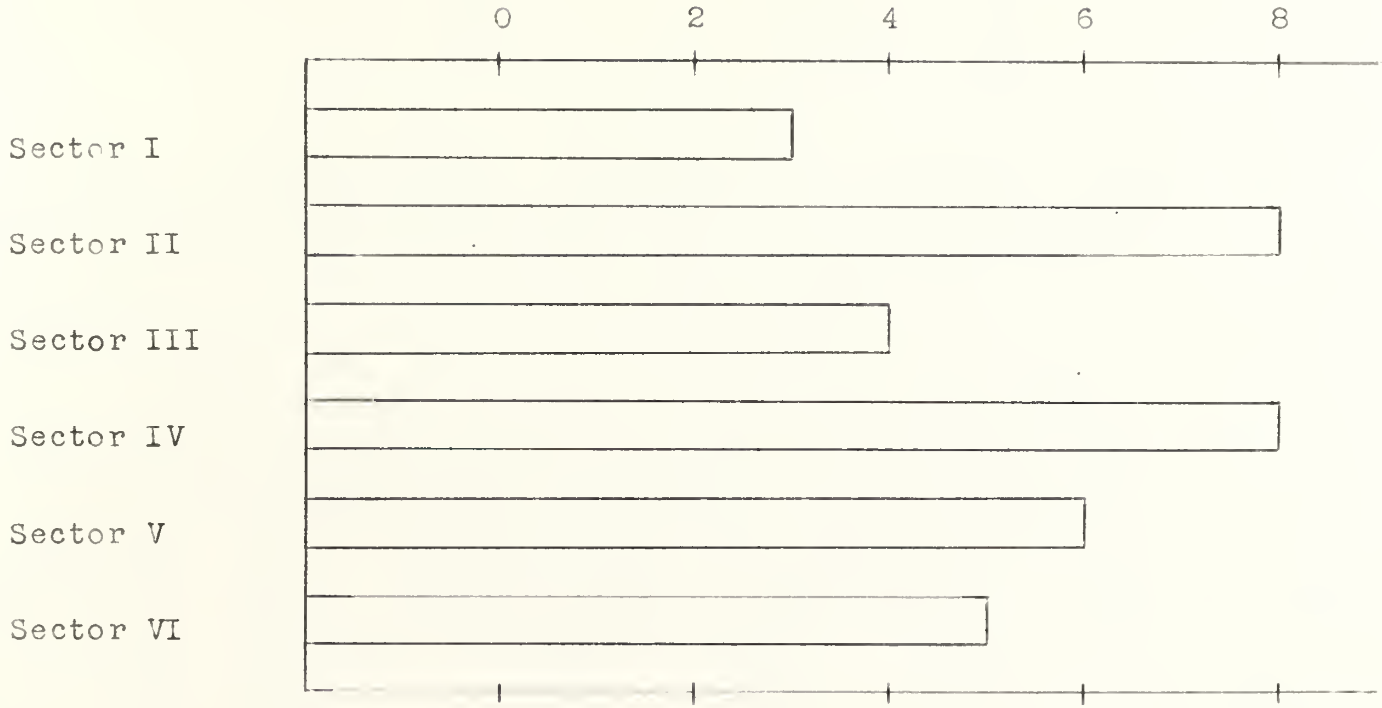
Total Zonal Types 353

Total Meridional Types 91

Total Blocking Types 98



Average Life Cycle of a Blocking Series in a Selected Sector



Northern Hemisphere Average for a Blocking Series is 8 Days

Figure 53

Average Life Cycle of Blocking Types in Selected Sectors

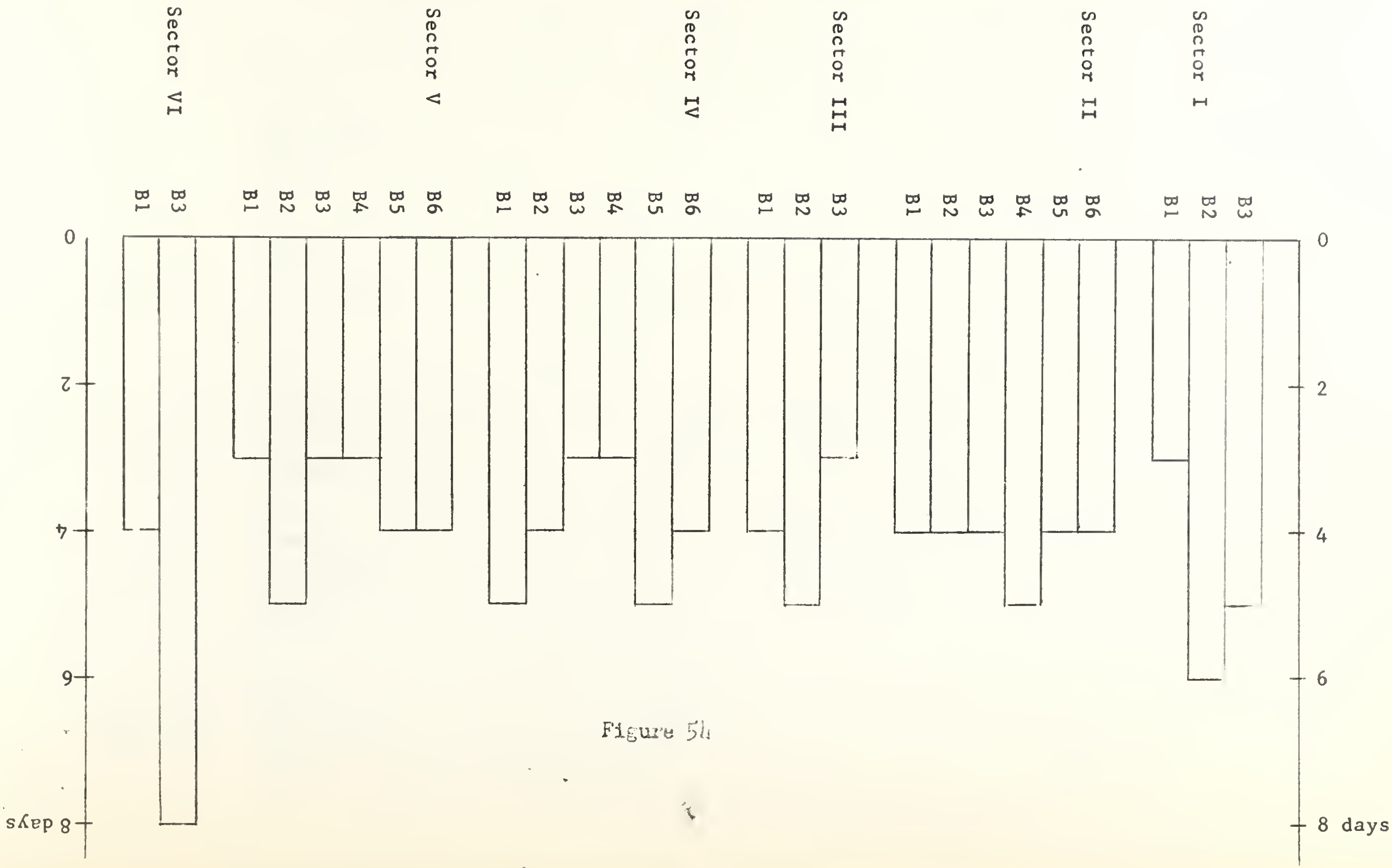


Figure 54

Probability of a Blocking Type in Sector II with a given Basic Type in any Selected Sector

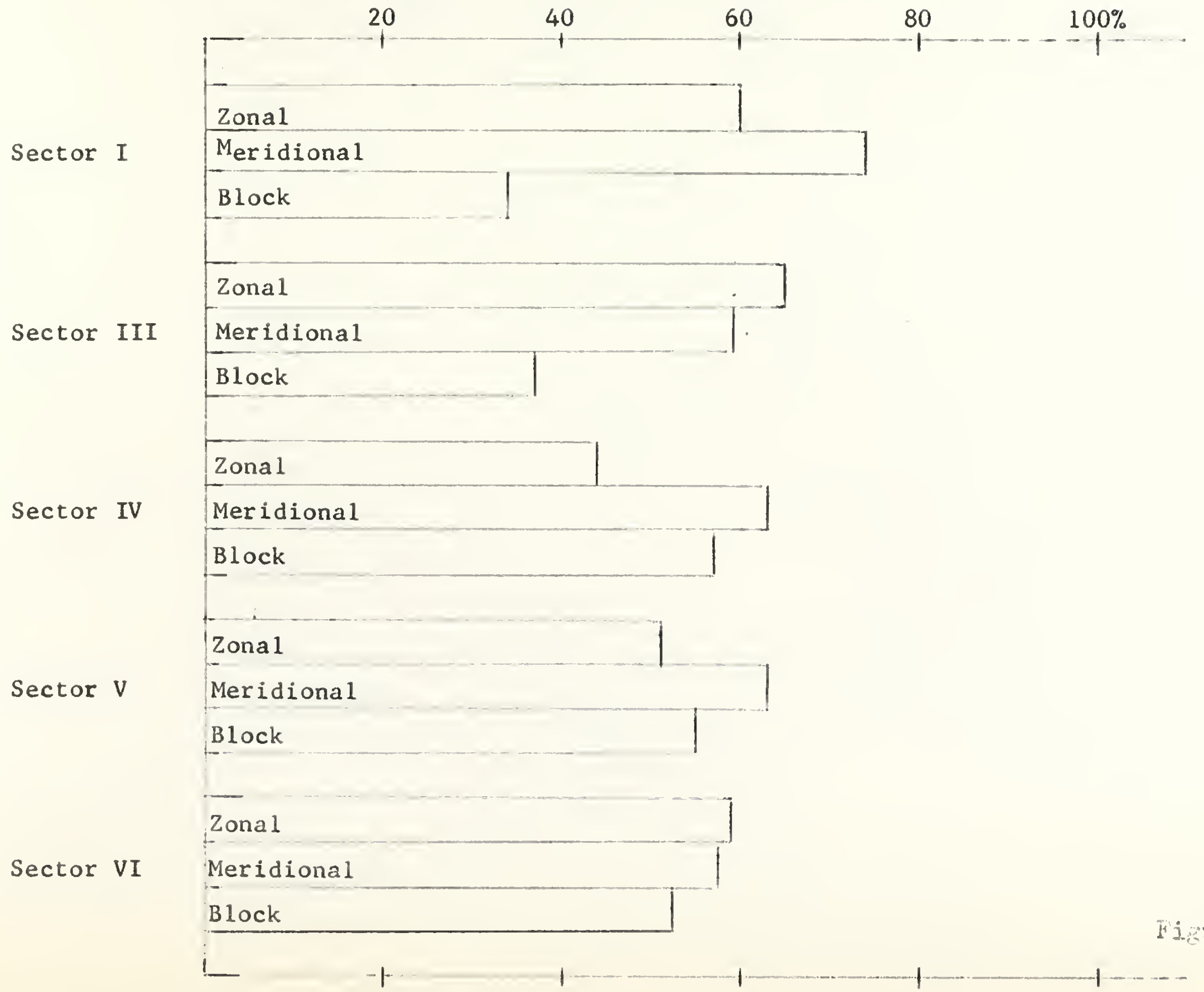


Figure 55

Probability of a Blocking Type in Sector IV with a given Basic Type in any selected Sector

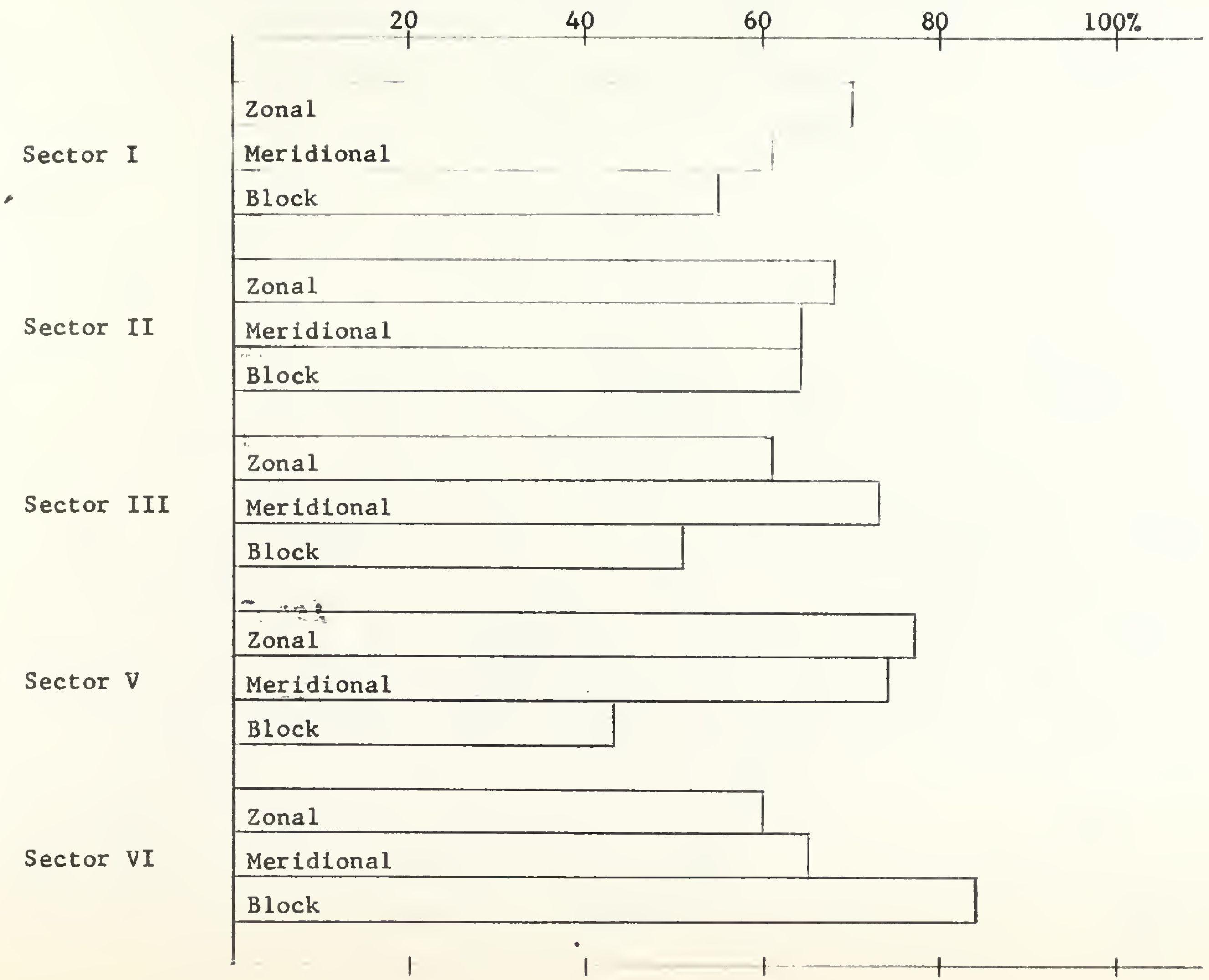


Figure 56

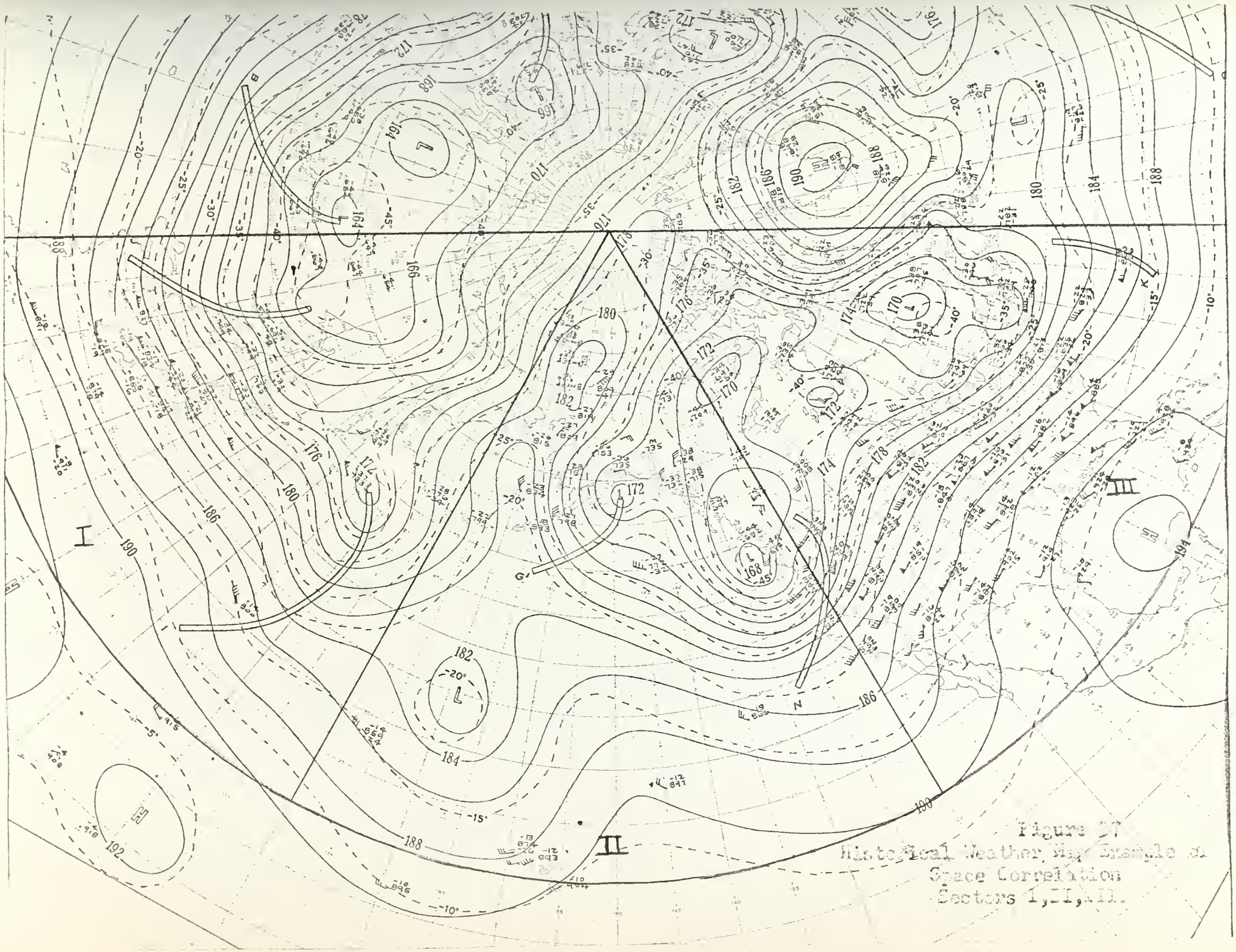


Figure 27
Historical Weather Map Example of
Space Correlation
Sectors I, II, III.

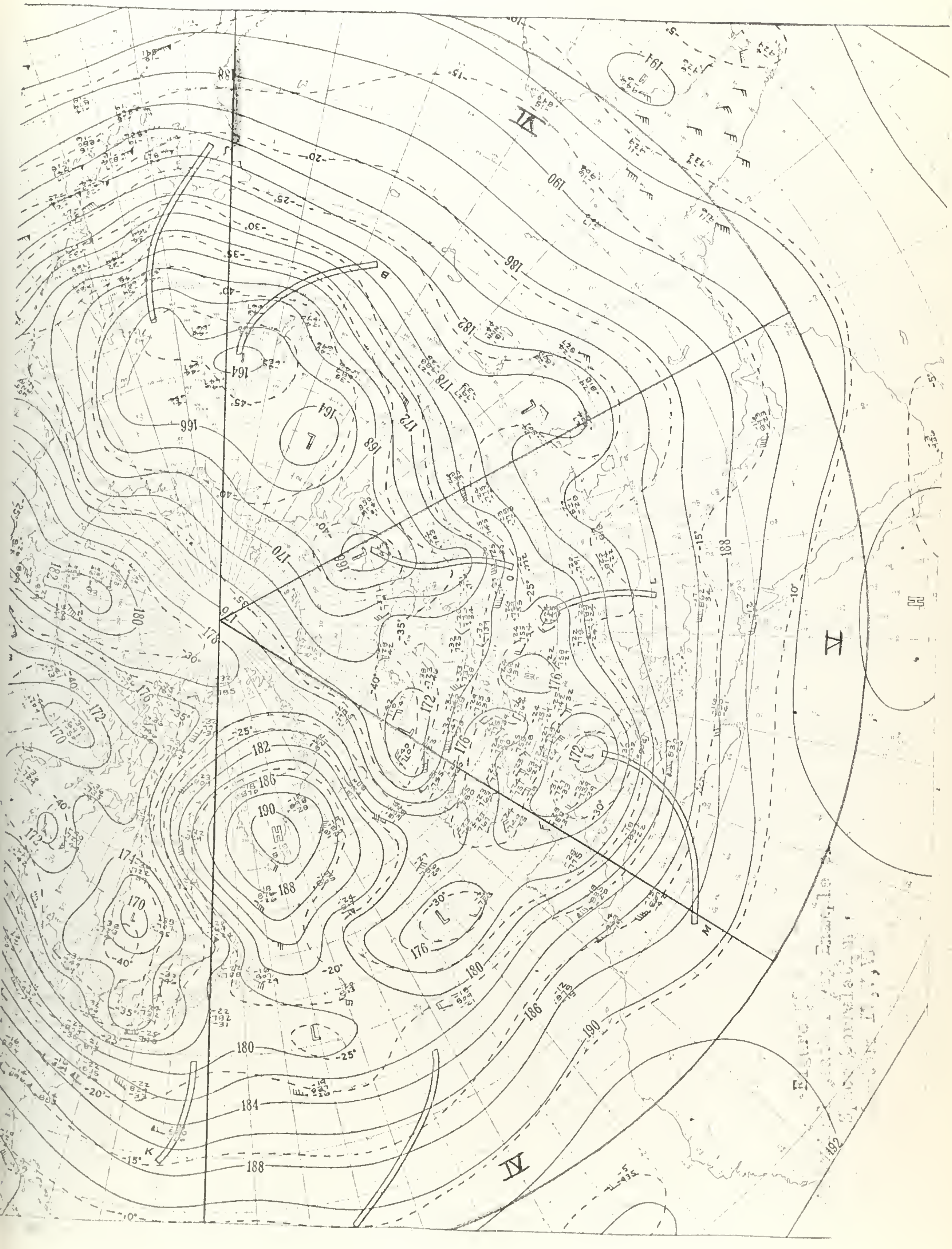


TABLE II

Space Correlation

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6
I vs IV	0	1	0	0	0	1	0	1	0	2	0	0	0	1	2	0	0	3	4	0	1	9	0
II vs IV	1	2	1	0	0	5	0	2	0	2	4	0	1	0	6	0	1	4	15	1	1	7	10
IIIvsIV	0	2	2	1	0	1	2	2	0	1	1	0	0	2	3	0	0	13	9	7	2	19	7
Total	1	5	3	1	0	7	2	5	0	5	5	0	1	3	11	0	1	20	28	8	4	35	17
I vs V	1	0	0	2	2	0	0	2	0	1	0	0	0	0	5	0	7	1	0	0	1	3	0
II vs V	1	0	0	11	1	1	0	2	0	5	1	0	0	0	2	1	20	0	0	7	2	2	7
IIIvsV	3	0	3	16	2	1	1	0	0	1	0	0	0	0	7	2	13	0	6	2	6	1	0
Total	5	0	3	29	5	2	1	4	0	7	1	0	0	0	14	3	40	1	6	9	9	6	7
I vs VI	3	0	5	8	0	0	0	2	0	0	0	2	0	1	0	0	0	0	0	4	0	0	0
II vs VI	6	8	11	19	0	1	1	0	0	0	0	5	2	2	0	0	0	0	0	8	0	0	0
IIIvsVI	7	4	23	18	0	0	0	0	0	0	0	5	4	2	0	0	0	0	0	11	0	0	0
Total	16	12	39	45	0	1	1	2	0	0	0	12	6	5	0	0	0	0	0	23	0	0	0

CHAPTER 8

CORRELATION OF SURFACE SYSTEMS WITH 500-MB TYPES

In order to devise a system whereby the mean tracks of surface cyclones and anticyclones could be investigated in relation to upper-air types and their evolutions, the authors examined the many parameters associated with the surface systems. It was quickly evident that some simple parameter must be used if a large sample was to be obtained. Consequently, as a first approximation to the identity of surface-system variations under each 500-mb type, the geographical positions of centers of cyclones and anticyclones were tabulated for a series of days for which the 500-mb pattern had been typed. All significant centers were noted, in all stages of development, without regard to any further subclassification. (It was believed that, if at least a mean track of these systems could be identified with a unique upper-air flow, the results would represent a good degree of the desired correlation.)

A program* was developed utilizing the IBM 717 Line Printer as a means of displaying the scatter of points representing the combined positions of surface systems for a 500-mb type. It should be noted that the actual latitude and longitude locations of the centers were transferred to a simple grid position through the use of an octal grid overlay.

* Program is on file at the Computation Center, United States Naval Post Graduate School.

Figure 59 shows a sample of the output of the line printer and indicates the scatter of centers of cyclones in sector I associated with 500-mb type M2. Figure 60 shows the same print-out with a latitude-longitude scale superimposed. Although it was intended at the beginning of the investigation to obtain the mean track, and evolution for all types, after the first computer print-out it was obvious that more data were needed. Time limitations prevented the collection of additional data.

However, the data used were enough to show that the upper-air types are associated with the surface weather and if the 500-mb type can be predicted, then the approximate positions of lows and highs could be forecast. Also, if a certain evolution of types takes place then the direction of movement of lows and highs can be forecast.

Using the computer's print-out of the scatter points of lows associated with each type, it will be shown how the tracks could be obtained. If a certain 500-mb type lasts for three days in one sector then the scatter of points would indicate the movement of lows during the three days, and a mean track could be obtained.

It was stated in Chapter 2 of this report that in sector I type B3 lasted an average of five days. The scatter of points for this type should contain the position of all lows passing through the sector in the five days and the average track of lows when this type occurs could be drawn.

Figure 61 shows the scatter of points for type B3 with

the estimated mean tracks drawn in. This compares favorably with the tracks obtained by other methods, such as [9,p.101].

A different procedure is used for an evolution of types, that is, for types that are usually grouped together or any that can be predicted to follow in succession. As an example, let us look at the evolution of M1, M2, M3, that is, a long-wave trough passing through Sector I at the 500-mb level. On day one, Sector I was typed as M1; day two, M2; and day three, M3.

To obtain the track of lows for this period the scatter of points of all three types are superimposed into one picture and the track drawn using the positions plotted on this picture. This is shown in Figure 62. Comparing this track with tracks obtained by other methods, normal cyclone tracks [4, chart 60], and examining the Historical Maps [8] of the days this evolution occurred (11, 12, 13 March 1952), it is believed that this is an excellent method of associating the surface weather with the 500-mb types.

It was intended to compare the types of Chapter I with those of Elliott [2], but in order to do so the mean cyclone tracks of each type were needed. Since the limitation of data prevented obtaining the cyclone tracks, this comparison could not be made.

Figure 97
Example of print out of the scatter of surface lows associated with type M2, Sector 1

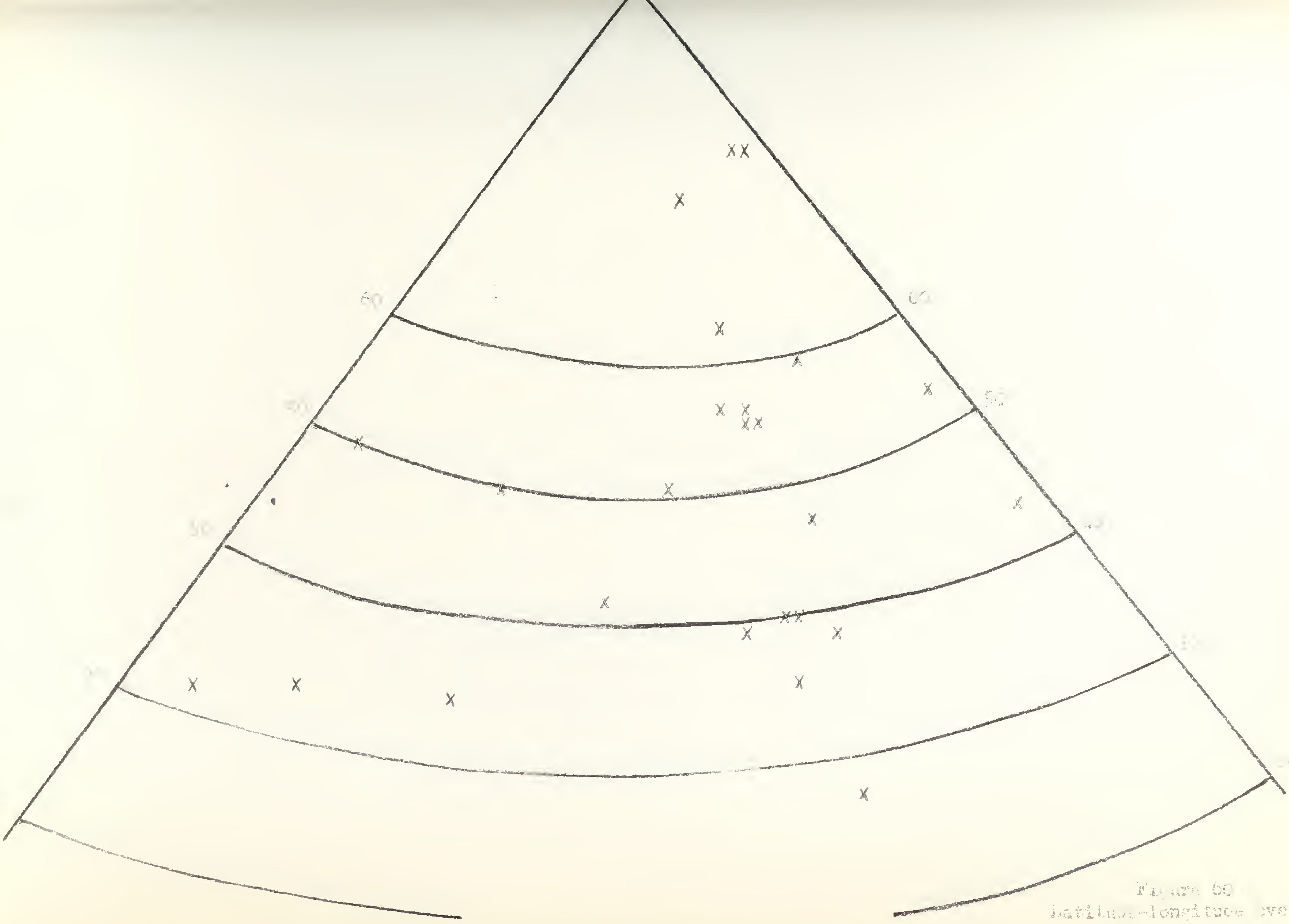


Figure 60
Latitude-longitude over[...]
superimposed on figure

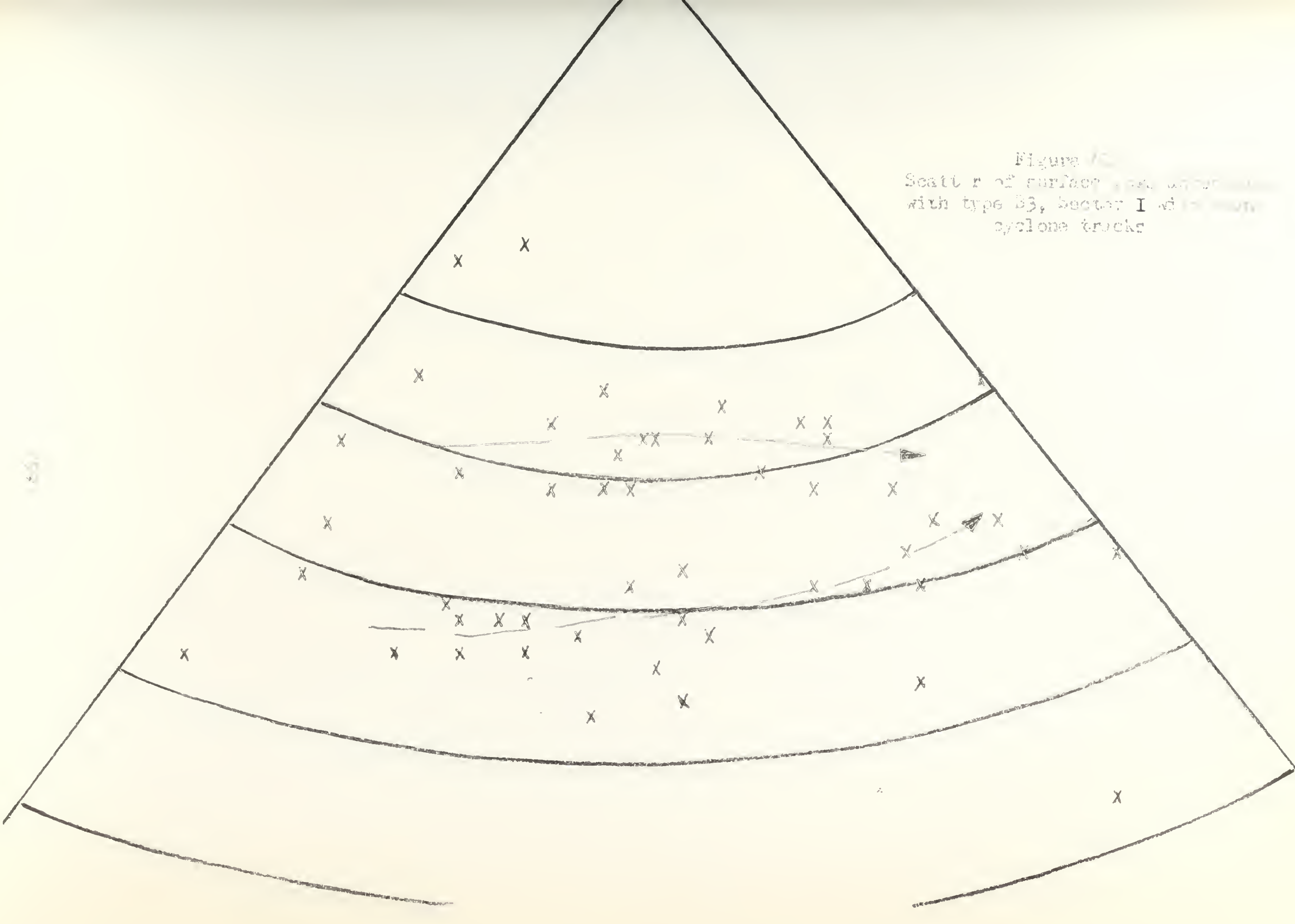


Figure [illegible]
Scatt r of surface [illegible]
with type B3, sector I [illegible]
cyclone tracks

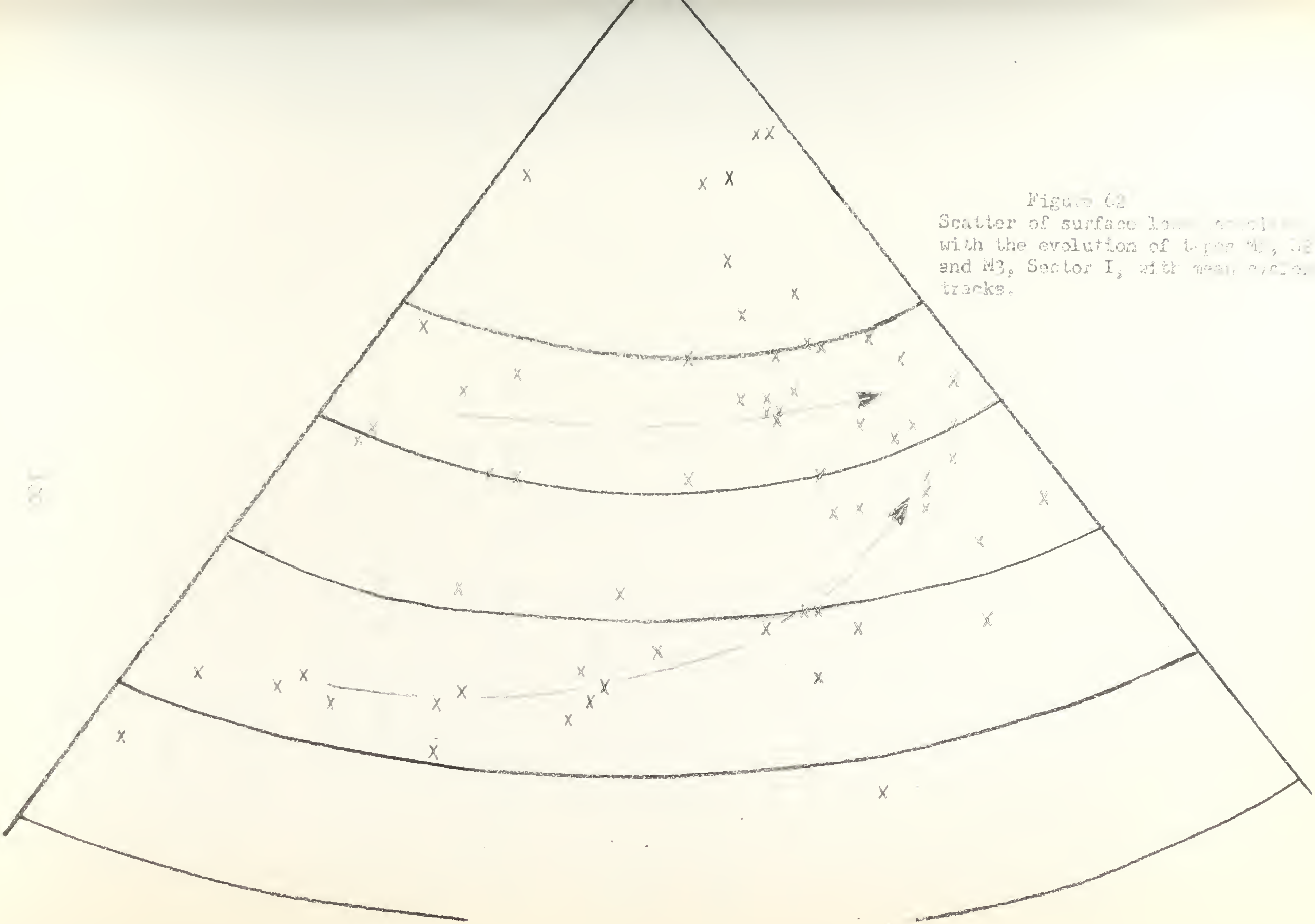


Figure 62
Scatter of surface lo[illegible]
with the evolution of types M1, M2,
and M3, Sector I, with mean cyclone
tracks.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

In the development of any method which can be useful in the field of extended-range forecasting, the construction of such a system must be of a scale commensurate with the scope of the parameters being considered. Various correlations based on existing weather-typing systems have met with only limited success; the scope of these systems were relatively narrow - primarily of a regional basis. Attempting to enlarge the scope of a weather-typing system to a hemispheric environment similarly increases the range of the entire problem. The success of the endeavor herein, therefore, must be measured in the proper scale, for it was possible to make only a start toward the development of a feasible system. The following general conclusions were reached by the authors as a result of the overall study:

1. The 500-mb level seems best suited as a basis for the entire hemispheric typing system. It is a relatively stable environment and one which exhibits large-scale features easily identified. Direct typing of the surface patterns only, using any reasonable set of parameters, is not presently feasible on a hemispheric scale.

2. The choice of sector orientation as explained in Chapter 1 appears reasonable in view of the results based on their use. Not only do the sectors divide the hemisphere into a logical geographical separation, but the sectors can readily be identified according to the predominant flow

found in this system.

3. The 500-mb classification of types seems to fulfill the first prerequisite of the model typing system since objectivity and simplicity have been emphasized. Further, the number of distinct types has been reduced to a minimum.

4. It has been shown that correlation of 500-mb types can be analyzed through the use of contingency tables. Simple or multiple relationships of types can be evaluated in numerous ways indicating the flexibility of the system. The stability of blocking types appears to be a significant factor of the hemispheric interaction of 500-mb flow. The ability of the system to predict at least the general flow in space and time shows promise that, after the accumulation of more data, prediction can be improved in space and extended in time.

5. The correlation between upper-air changes and surface trends continues to be the weakest phase of the system. However, in spite of the limited results shown in Chapter 4, the approach of determining a mean track of surface systems is considered valid.

It is conclusive to the authors that the system, as developed herein, is based on a logical concept and that a sound framework of a practical weather typing method has been defined fundamentally. It is equally conclusive that this thesis is not complete in itself and that considerable study must yet be devoted to the subject before a workable method can be attained.

Recommendations

The following areas of future study are recommended:

1. An extension of the basic calendar of Appendix I to obtain as much data as possible for input to the contingency program.

2. Although the concept explained in Chapter 3 is valid, it is now questionable that this method will produce the necessary results, especially under the influence of meridional flow. It is recommended that careful analysis be made of the action of surface systems under varying types of meridional flow. This problem should be scrutinized closely and cannot be examined exclusive of 500-mb type evolutions but only in relation to the upper-air flow.

3. The determination of mean surface tracks of cyclones and anticyclones in relation to 500-mb types should be solved before the introduction of additional surface parameters such as areas of cyclogenesis, central pressures, speed of movement, etc. The influence of seasonal variation of surface tracks should also be considered.

4. More sophisticated computer programs can be devised to determine directly any combination of correlation parameters. In particular, given a basic calendar of types, prediction schemes could be programmed so that the evolution of types could be determined directly as a computer output in space, in time, or both. However, the use of the contingency tables should be exploited more fully before more advanced programs are considered.

[illegible] recommendation [illegible] [illegible] that the problems left unanswered must be solved before the weather-typing system can be advanced to the stage of operational use. More imaginative recommendations might conceivably be mentioned but these would only tend to deviate from the simple, direct and thus more fruitful avenue of effort.

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APPENDIX I

Calendar of Types

January 1952

DATE	SECTOR					
	I	II	III	IV	V	VI
1	Z-4	P-3	M-4	Z-2	M-11	Z-4
2	M-1	Z-2	M-4	M-7	M-11	M-8
3	M-2	M-9	M-12	M-4	M-1	M-8
4	Z-1	B-4	Z-4	M-4	M-1	M-8
5	Z-3	P-4	Z-4	B-2	M-2	M-8
6	Z-3	P-4	M-6	B-2	M-13	B-3
7	M-4	B-4	M-7	P-2	M-13	P-3
8	M-1	M-5	M-7	P-2	M-13	Z-3
9	M-3	M-6	Z-4	P-2	M-13	M-9
10	M-1	B-4	M-6	P-2	M-11	M-9
11	Z-1	P-4	Z-4	B-2	M-11	Z-3
12	M-2	P-4	Z-2	B-2	Z-3	Z-3
13	M-3	B-4	Z-2	P-2	M-13	Z-3
14	M-7	P-4	Z-2	P-2	M-11	Z-3
15	M-4	P-5	Z-4	P-2	M-11	Z-3
16	Z-1	P-6	Z-4	P-2	M-11	Z-3
17	M-1	P-6	M-12	P-2	Z-4	Z-3
18	M-11	P-6	Z-2	B-2	M-4	Z-3
19	Z-3	P-6	Z-4	P-2	M-4	Z 3
20	Z-3	P-6	M-6	B-2	M-13	M-9
21	Z-1	P-6	Z-1	P-2	M-13	Z-3
22	Z-1	P-1	M-2	P-2	B-5	Z-3
23	Z-1	P-1	M-2	P-5	P-6	M-9
24	Z-1	P-1	M-3	P-5	B-6	M-9
25	B-3	P-1	Z-3	P-5	Z-4	Z-3
26	P-3	P-1	Z-2	P-2	Z-4	Z-3
27	B-3	P-1	M-13	M-13	Z-4	M-3
28	Z-1	P-1	M-6	M-3	Z-4	P-3
29	Z-4	P-1	M-3	P-2	Z-4	P-3
30	M-10	M-1	M-3	B-2	Z-4	M-3
31	Z 3	M-2	Z-3	P-2	M-13	M-3

February 1952

DATE	I	II	III	IV	V	VI
1	Z-1	Z-3	M-5	M-1	M-11	Z-4
2	Z-1	M-4	Z-2	M-4	M-4	M-8
3	Z-1	M-4	Z-4	B-4	B-2	M-8
4	Z-1	M-4	M-5	B-4	B-2	Z-4
5	Z-1	M-4	M-6	B-4	B-2	Z-4
6	Z-1	M-7	M-6	B-4	M-13	Z-4
7	Z-3	M-4	M-6	B-5	M-13	Z-4
8	Z-3	M-4	M-12	B-5	M-4	Z-4
9	Z-1	M-2	M-12	B-5	M-4	B-3
10	M-2	M-6	B-6	B-5	M-4	B-3
11	Z-1	Z-3	B-6	B-6	M-3	B-3
12	Z-1	Z-3	B-6	B-6	M-11	B-3
13	Z-1	Z-3	B-6	B-6	M-11	B-3
14	Z-1	M-4	B-6	B-6	M-11	B-3
15	Z-1	B-5	B-5	B-6	Z-4	B-3
16	Z-1	B-5	B-5	B-6	M-13	B-3
17	Z-1	B-4	B-5	B-6	M-13	B-3
18	Z-1	M-8	B-5	B-6	M-13	B-3
19	Z-1	M-9	B-5	B-6	M-13	B-3
20	Z-1	M-10	B-5	B-6	M-13	B-3
21	Z-1	M-4	B-5	B-6	Z-4	B-3
22	Z-1	M-4	B-5	B-6	M-6	B-3
23	Z-1	B-3	B-5	B-6	Z-4	B-3
24	Z-1	B-3	M-12	B-6	M-12	B-3
25	M-3	B-4	M-12	B-6	M-12	B-3
26	Z-1	B-4	M-6	B-6	M-12	B-3
27	Z-1	B-4	M-6	B-6	M-1	B-3
28	Z-1	B-4	M-6	B-6	M-1	B-3
29	Z-1	B-4	Z-1	B-6	M-1	B-3

March 1952

DATE	SECTOR					
	I	II	III	IV	V	VI
1	Z-1	B-2	Z-1	B-5	M-6	M-8
2	Z-1	M-9	Z-4	B-5	M-6	M-8
3	Z-1	M-9	Z-4	B-5	B-2	Z-1
4	M-3	Z-2	Z-4	B-5	B-3	Z-3
5	Z-1	B-2	Z-4	B-5	B-3	Z-3
6	Z-1	B-2	Z-4	B-5	B-3	Z-3
7	Z-1	B-2	Z-4	B-5	B-3	Z-3
8	Z-1	B-2	Z-4	Z-4	B-3	Z-4
9	Z-1	B-2	Z-4	M-1	B-6	M-10
10	Z-1	B-2	Z-4	M-4	B-6	Z-4
11	M-1	B-2	Z-4	B-3	B-6	Z-4
12	M-2	B-2	Z-4	B-3	B-6	Z-3
13	M-3	B-2	Z-4	B-3	B-4	Z-3
14	M-3	B-4	Z-4	B-3	B-4	Z-3
15	M-4	B-4	Z-4	Z-4	B-4	3
16	B-3	B-4	M-6	Z-4	B-5	Z 3
17	B-3	M-5	M-7	M-10	B-5	M-9
18	B-3	M-6	M-7	M-4	B-5	M-9
19	B-3	Z-3	Z-4	B-4	B-6	M-8
20	B-3	B-2	Z-4	B-4	B-6	M-8
21	B-3	B-2	Z-4	B-4	B-6	M-8
22	B-3	B-2	Z-4	M-4	Z-4	Z-4
23	B-3	B-2	Z-4	Z-4	M-2	Z-4
24	B-3	B-2	M-1	M-2	M-3	Z-4
25	B-3	B-2	M-2	B-6	3	Z-4
26	B-3	B-2	M-2	B-6	Z-3	Z-4
27	B-3	M-5	M-2	B-6	Z 3	Z-4
28	Z-1	Z-2	M-8	B-5	3	Z-4
29	M-2	Z-2	Z-3	B-5	M-12	Z-4
30	M-4	Z-2	M-7	B-5	M-12	Z-4
31	Z-2	Z-2	Z-3	B-5	M-12	Z-4

January 1953

DATE	SECTOR I	II	III	IV	V	VI
1	Z-1	M-4	Z-4	B-2	M-4	M-10
2	Z-1	M-4	M-5	B-2	M-4	Z-3
3	Z-1	M-4	M-2	B-2	M-1	[illegible]
4	Z-1	M-4	M-2	B-2	M-13	Z-3
5	M-7	B-1	M-2	B-2	M-13	Z-3
6	M-4	B-1	Z-1	B-2	M-13	Z-3
7	M-2	B-1	Z-3	B-2	M-13	Z-3
8	Z-1	B-1	M-6	B-2	M-13	Z-3
9	Z-1	B-6	M-5	B-2	M-13	Z-3
10	Z-1	B-6	M-5	B-4	M-13	Z-3
11	Z-1	B-6	M-6	B-3	M-13	M-8
12	B-3	Z-4	M-6	B-3	M-13	M-8
13	B-3	Z-1	M-3	B-2	Z-4	M-9
14	B-3	M-10	Z-2	B-4	Z-4	Z-4
15	B-3	Z-2	M-13	B-4	M-13	M-10
16	Z-1	M-9	M-13	B-4	M-13	Z-4
17	Z-1	Z-1	M-4	B-4	M-13	Z-4
18	Z-1	Z-2	M-2	B-1	M-13	Z-3
19	Z-1	Z-2	Z-3	B-6	M-13	Z-4
20	Z-1	M-1	Z-3	B-6	M-13	Z-4
21	Z-4	M-4	Z-4	B-2	M-13	Z-4
22	Z-1	M-4	Z-4	B-4	Z-4	Z-4
23	M-2	M-5	M-5	M-11	Z-4	Z-4
24	M-3	M-6	M-5	B-2	M-3	Z-4
25	Z-1	B-6	M-6	B-2	M-3	B-3
26	Z-1	B-6	M-3	M-10	M-13	B-3
27	B-3	M-4	Z-3	B-4	M-13	B-3
28	B-2	M-4	M-2	B-4	M-13	B-3
29	B-2	M-4	M-3	B-4	M-13	B-3
30	Z-1	M-10	Z-2	B-2	M-6	B-1
31	Z-1	M-10	M-6	B-5	M-6	B-3

February 1953

DATE	SECTOR					
	I	II	III	IV	V	VI
1	Z-1	Z-3	Z-2	B-1	Z-4	B-3
2	Z-1	Z-1	Z-2	B-1	Z-4	B-1
3	Z-1	Z-1	M-6	B-1	Z-1	B-3
4	Z-1	M-4	M-6	B-1	Z-1	B-3
5	B-3	M-4	M-3	B-1	Z-1	B-3
6	B-3	Z-3	M-5	M-10	Z-1	Z-3
7	B-3	M-4	M-6	M-4	B-2	Z-4
8	B-3	M-4	Z-4	Z-2	B-2	Z-4
9	B-3	M-4	M-12	M-8	B-2	Z-3
10	B-3	M-10	M-7	M-5	B-2	B-2
11	Z-1	M-10	M-7	M-5	B-2	B-3
12	Z-1	M-10	M-12	B-1	B-2	B-3
13	Z-2	M-4	M-12	B-1	B-2	B-3
14	Z-1	B-1	M-5	B-1	M-13	B-3
15	Z-1	B-1	M-2	B-1	M-13	B-3
16	[illegible]-3	B-1	M-8	B-4	M-13	B-3
17	[illegible]-1	B-4	M-2	B-4	M-13	B-3
18	B-1	B-4	Z-1	[illegible]-4	M-13	M-9
19	B-1	B-4	M-4	B-2	M-13	Z-3
20	B-1	B-4	M-4	B-4	M-13	M-8
21	B-1	B-4	[illegible]-4	B-4	M-12	Z-3
22	B-1	B-4	M-12	M-11	B-4	Z-2
23	Z-3	B-4	M-12	M-11	B-1	Z-2
24	Z-3	B-4	Z-4	M-11	B-4	Z-2
25	Z-3	B-4	M-12	M-1	B-4	Z-2
26	Z-3	B-4	[illegible]-3	M-1	B-4	Z-2
27	M-3	B-4	M-3	M-4	B-4	Z-3
28	M-7	B-4	Z-4	[illegible]-4	B-4	Z-2

March 1953

DATE	SECTOR					
	I	II	III	IV	V	VI
1	Z-4	B-4	M-7	B-3	B-4	Z-3
2		B-4	M-4	B-3	B-4	Z-3
3	M-2	B-4	M-7	B-3	B-4	Z-3
4	M-3	B-4	M-2	B-3	B-4	Z-3
5	M-1	B-4	M-3	B-3	B-4	Z-3
6	M-4	B-4	M-3	B-3	B-4	Z-3
7	M-7	M-5	M-3	B-3	B-4	Z-3
8	M-4	M-7	M-6	B-3	B-4	Z-3
9	M-4	M-6	M-6	B-3	B-4	Z-3
10	Z-3	M-6	M-6	B-3	B-4	Z-3
11	Z-2	M-6	Z-4	B-6	M-13	Z-3
12	Z-3	M-6	Z-3	B-6	M-13	Z-3
13	Z-3	M-10	M-4	B-3	B-4	Z-3
14	B-3	Z-2	M-4	B-3	B-4	Z-3
15	B-3	Z-2	B-6	Z-4	B-5	Z-3
16	B-3	Z-2	B-5	M-11	B-5	Z-3
17	B-3	Z-2	B-5	M-11	B-5	Z-3
18	M-6	M-6	B-5	M-11	B-5	Z-3
19	M-6	M-6	B-5	M-11	B-5	Z-3
20	M-7	Z-2	M-7	M-11	B-5	M-10
21	M-5	M-4	M-4	M-11	B-5	M-2
22	M-3	M-5	M-4	M-11	B-5	Z-3
23	Z-2	M-5	M-4	B-3	B-4	Z-3
24	Z-3	Z-2	M-5	B-3	B-4	Z-3
25	B-3	M-2	M-5	Z-4	B-5	Z-3
26	B-3	M-2	Z-4	Z-4	B-5	Z-3
27	B-3	M-3	M-6	B-5	Z-4	M-10
28	B-1	M-7	M-6	B-5	Z-4	M-10
29	B-1	M-4	M-7	B-5	Z-4	Z-4
30	B-1	Z-2	M-7	B-5	Z-4	Z-4
31	B-1	Z-2	Z-4	B-5	Z-4	Z-4

January 1954

DATE	SECTOR					
	I	II	III	IV	V	VI
1	M-10	B-1	Z-3	B-2	M-13	Z-3
2	M-1	B-1	Z-[illegible]	B-2	M-13	Z-3
3	Z-2	B-1	Z-3	B-2	Z-4	Z-3
4	Z-1	B-1	M-2	B-2	M-13	Z-2
5	Z-1	B-1	M-2	B-2	M-13	Z-1
6	Z-1	B-1	M-6	B-6	Z-4	Z-3
7	Z-1	M-7	M-6	B-6	Z-4	Z-3
8	M-3	B-4	Z-3	B-2	Z-4	M-1
9	M-10	B-3	M-1	B-1	Z-4	M-9
10	M-4	B-3	M-1	B-4	Z-4	Z-3
11	M-4	B-3	M-2	B-4	M-2	Z-3
12	Z-3	B-3	M-7	B-3	M-2	Z-1
13	Z-3	B-3	M-1	B-2	M-11	B-3
14	Z-3	B-5	M-1	B-2	M-11	B-3
15	Z-3	B-5	M-1	B-2	M-13	B-3
16	Z-3	B-5	Z-3	M-11	M-13	M-2
17	Z-1	B-5	M-6	M-4	M-2	Z-1
18	M-11	B-5	Z-3	B-4	M-13	Z-1
19	Z-1	B-6	Z-3	B-4	M-13	Z-1
20	Z-1	B-6	M-13	B-6	M-13	Z-1
21	Z-1	B-6	Z-2	B-6	M-13	B-3
22	Z-1	B-6	Z-2	B-4	M-12	B-3
23	Z-1	B-6	Z-2	M-11	B-5	B-3
24	Z-1	B-6	Z-2	M-11	B-5	Z-1
25	M-11	B-6	Z-2	M-11	B-5	Z-1
26	M-11	B-6	Z-2	M-11	B-5	Z-1
27	B-2	M-2	M-2	M-11	B-5	Z-3
28	B-2	Z-4	M-3	M-11	B-5	Z-3
29	B-2	M-1	Z-3	B-2	Z-4	M-9
30	B-2	B-3	M-6	B-2	M-13	M-9
31	B-2	B-3	M-6	B-3	M-13	M-9

February 1954

DATE	SECTOR					
	I	II	III	IV	V	VI
1	B-2	B-3	M-3	B-1	M-7	M-9
2	B-2	B-3	M-2	B-1	M-13	M-9
3	Z-1	B-3	M-2	B-1	M-13	M-9
4	Z-1	M-1	B-6	B-2	M-13	Z-1
5	Z-1	M-1	B-6	B-2	Z-4	Z-1
6	Z-1	M-1	B-6	B-2	B-6	Z-1
7	Z-1	M-2	B-6	B-2	B-6	Z-1
8	Z-1	M-2	B-6	B-2	B-6	Z-1
9	Z-1	B-5	M-3	Z-2	B-6	Z-1
10	Z-2	B-5	Z-3	M-9	B-6	Z-2
11	Z-3	B-5	M-2	B-2	B-6	Z-2
12	Z-1	B-5	M-6	B-1	B-6	Z-2
13	Z-1	B-5	Z-2	B-1	B-6	Z-3
14	B-3	Z-1	Z-3	B-1	M-13	Z-1
15	B-3	Z-3	M-1	B-2	M-13	Z-1
16	B-3	Z-3	Z-2	B-4	M-13	Z-2
17	B-3	Z-3	Z-2	B-4	B-5	Z-2
18	B-3	M-1	M-7	M-11	B-5	Z-2
19	B-3	M-1	M-4	M-11	B-5	Z-2
20	B-3	M-1	M-4	B-2	B-5	Z-4
21	B-3	Z-2	M-2	B-2	B-5	Z-2
22	M-2	B-3	M-2	B-4	B-5	Z-2
23	M-6	B-3	M-2	B-2	B-5	Z-2
24	Z-2	B-4	M-2	B-2	B-5	Z-2
25	Z-2	B-4	Z-2	B-2	B-5	Z-3
26	Z-2	B-4	Z-2	B-5	B-6	Z-3
27	M-9	B-4	M-1	B-5	B-6	Z 3
28	Z-2	B-4	M-2	B-5	B-6	Z-3

March 1954

DATE	SECTOR					
	I	II	III	IV	V	VI
1	M-9	B-4	M-2	B-5	B-6	Z-3
2	M-4	B-2	M-2	B-5	B-2	Z-3
3	M-4	B-2	M-2	B-5	B-2	Z-2
4	M-1	M-5	M-6	M-3	B-2	Z-2
5	B-3	B-3	M-6	B-5	B-2	Z-2
6	B-3	B-3	M-6	B-5	B-2	Z-2
7	B-3	B-3	Z-3	B-5	B-2	Z-2
8	B-3	B-3	M-2	Z-4	B-2	Z-3
9	B-3	B-4	M-6	M-11	B-2	Z-3
10	Z-4	B-4	B-6	Z-4	B-2	Z-3
11	Z-2	B-4	B-5	M-7	B-2	Z-3
12	M-1	M-10	B-5	M-11	B-3	Z-3
13	M-1	Z-2	B-5	M-11	B-3	Z-3
14	Z-1	B-5	B-5	B-6	B-6	Z-3
15	M-1	B-5	B-5	B-6	M-12	Z-3
16	M-1	B-5	M-6	B-6	Z-4	Z-3
17	Z-1	B-5	M-6	B-6	Z-4	Z-3
18	Z-1	B-5	Z-4	B-6	Z-4	Z-3
19	M-3	B-5	M-9	M-11	B-3	M-3
20	Z-1	B-5	M-12	M-11	B-3	Z-4
21	Z-1	B-5	M-12	M-11	Z-4	Z-2
22	Z-1	B-5	M-12	B-2	Z-4	Z-2
23	Z-1	B-5	M-12	B-2	Z-4	Z-2
24	M-1	B-5	M-12	B-2	Z-4	Z-2
25	Z-1	B-5	M-12	B-2	M-13	Z-2
26	Z-1	B-5	Z-3	B-2	M-13	M-9
27	Z-1	B-5	Z-3	M-11	M-7	M-10
28	Z-1	B-5	Z-3	M-11	B-3	Z-3
29	Z-1	B-5	Z-3	M-11	B-3	Z-3
30	Z-1	B-1	Z-3	M-11	B-3	Z-3
31	Z-1	B-1	Z-3	M-9	B-3	Z-3

January 1955

DATE	SECTOR I	II	III	IV	V	VI
1	Z-1	M-6	Z-4	B-3	B-2	Z-4
2	Z-1	M-10	M-12	B-3	B-2	Z-1
3	Z-1	M-10	M-7	B-3	B-5	Z-1
4	Z-1	M-9	M-4	B-3	Z-4	Z-4
5	Z-1	M-4	M-4	B-3	Z-4	Z-1
6	Z-1	B-3	M-12	B-5	Z-4	Z-4
7	Z-1	B-3	M-12	B-5	Z-4	Z-4
8	Z-1	B-4	M-12	B-5	Z-4	M-10
9	M-7	B-3	M-12	B-5	Z-4	M-10
10	M-4	B-3	Z-3	B-5	M-13	M-10
11	Z-1	M-10	Z-3	B-5	Z-4	Z-4
12	Z-1	M-10	M-12	B-5	Z-4	Z-4
13	Z-1	M-10	M-6	B-5	Z-4	B-3
14	Z-4	Z-2	M-7	B-5	Z-2	B-3
15	M-1	Z-2	Z-1	B-5	M-3	B-3
16	Z-1	Z-2	Z-1	B-5	Z-1	B-3
17	Z-1	Z-2	Z-1	B-5	M-1	B-3
18	Z-1	M-6	Z-4	Z-4	M-1	M-10
19	Z-1	M-10	Z-4	Z-4	M-2	M-10
20	Z-4	B-3	M-7	Z-4	M-6	B-3
21	Z-1	B-3	M-4	M-1	Z-4	B-3
22	Z-1	B-3	M-12	M-4	Z-4	B-3
23	Z-1	B-3	M-1	M-10	M-13	B-3
24	Z-1	M-10	M-2	M-4	M-13	B-3
25	Z-1	M-4	M-3	M-4	Z-4	Z-4
26	M-1	M-4	M-3	Z-4	Z-4	Z-3
27	M-2	M-4	M-3	Z-3	Z-4	Z-3
28	Z-3	M-2	M-2	Z-1	Z-4	Z-4
29	Z-3	M-11	M-6	Z-3	Z-4	Z-4
30	Z-1	M-11	M-6	B-5	Z-4	Z-4
31	Z-1	Z-3	M-3	B-5	Z-4	Z-4

February 1955

DATE	SECTOR					
	I	II	III	IV	V	VI
1	Z-1	M-7	B-2	Z-4	M-7	Z-1
2	Z-1	M-10	B-2	Z-4	M-7	Z-1
3	Z-1	M-10	B-2	Z-1	M-11	Z-1
4	M-4	B-4	M-7	Z-4	M-11	Z-1
5	B-2	B-4	M-7	M-4	M-11	Z-1
6	B-2	B-4	M-4	M-4	M-11	Z-1
7	B-2	B-3	M-12	B-4	M-13	Z-1
8	Z-3	B-4	M-2	B-4	M-13	Z-1
9	Z-1	M-5	Z-3	B-5	M-4	Z-1
10	Z-1	M-5	M-1	B-5	M-4	Z-1
11	M-4	M-1	M-6	B-5	Z-3	Z-1
12	M-3	M-6	M-6	B-1	Z-1	Z-1
13	Z-1	M-5	M-6	B-1	Z-3	Z-1
14	Z-1	M-13	M-6	B-1	M-11	Z-1
15	Z-1	M-13	M-3	B-1	M-2	Z-1
16	M-2	M-6	M-6	B-5	Z-3	Z-1
17	Z-1	B-3	M-7	B-5	Z-3	M-8
18	Z-1	B-3	M-12	B-5	Z-2	M-9
19	Z-1	B-3	M-12	B-1	M-11	M-10
20	M-4	B-3	M-4	B-1	M-11	M-9
21	M-4	B-3	M-4	B-1	M-11	M-9
22	Z-3	B-4	Z-4	B-1	M-11	M-9
23	Z-3	B-4	M-1	B-4	Z-1	Z-4
24	M-11	B-4	Z-3	M-6	Z-1	M-8
25	M-11	B-4	Z-3	M-6	M-6	M-8
26	Z-1	B-5	Z-3	M-7	Z-1	M-8
27	M-7	B-6	Z-3	M-4	M-13	Z-3
28	Z-1	B-6	Z-3	M-4	M-13	Z-1

March 1955

DATE	SECTOR					
	I	II	III	IV	V	VI
1	M-11	B-6	Z-3	Z-2	B-5	Z-4
2	Z-1	B-4	Z-3	M-11	B-4	Z-3
3	B-3	B-4	Z-3	B-3	B-4	Z-3
4	B-3	B-4	Z-3	B-1	Z-4	Z-3
5	Z-1	B-4	Z-3	B-1	Z-4	Z-3
6	Z-1	B-4	M-2	B-1	M-13	Z-3
7	M-2	B-4	M-3	B-1	M-13	Z-3
8	M-3	B-4	M-7	B-1	M-4	Z-3
9	Z-2	B-4	Z-3	B-1	M-13	Z-3
10	Z-1	Z-2	Z-3	B-1	M-13	Z-3
11	Z-2	M-8	Z-3	B-1	Z-4	Z-3
12	Z-2	M-6	Z-3	B-1	Z-4	M-9
13	M-4	M-7	Z-3	B-1	Z-4	M-9
14	M-1	B-3	Z-3	B-1	Z-4	Z-3
15	M-2	B-3	Z-3	B-1	Z-4	Z-3
16	Z-2	B-3	M-12	B-1	Z-4	Z-3
17	Z-2	B-3	M-12	B-1	Z-4	Z-3
18	M-4	B-3	M-12	B-1	M-1	Z-4
19	M-10	B-3	Z-1	B-5	M-1	Z-4
20	Z-2	B-3	M-12	B-5	M-11	Z-4
21	Z-2	B-3	M-4	B-5	M-11	Z-4
22	Z-2	B-3	M-4	B-5	M-11	Z-3
23	Z-2	B-3	Z-1	B-5	M-11	Z-3
24	Z-2	M-4	Z-1	M-3	M-11	Z-3
25	Z-2	M-4	Z-1	M-3	M-6	Z-3
26	Z-2	M-4	M-6	M-2	M-11	Z-3
27	Z-2	M-1	M-12	M-2	M-11	Z-3
28	Z-2	Z-2	M-6	B-1	M-11	Z-4
29	M-2	Z-3	M-6	B-1	M-12	Z-4
30	Z-2	M-4	M-7	B-1	M-12	Z-4
31	Z-3	M-6	Z-4	B-1	M-12	M-9

January 1956

DATE	SECTOR					
	I	II	III	IV	V	VI
1	M-11	B-5	M-6	B-2	M-13	B-3
2	M-2	B-5	Z-4	B-2	M-13	B-3
3	M-6	B-5	M-8	B-2	M-13	B-3
4	Z-3	B-5	M-6	B-3	M-13	M-8
5	Z-3	B-5	M-6	B-5	B-4	M-8
6	M-11	B-5	M-6	B-5	B-4	Z-4
7	M-11	B-5	M-6	B-5	Z-4	Z-4
8	M-11	B-5	B-2	B-5	M-1	B-3
9	M-11	B-5	B-2	B-5	M-1	B-3
10	M-11	B-6	B-2	B-5	M-11	Z-4
11	M-11	B-6	B-3	B-5	M-11	Z-4
12	M-11	B-6	B-3	B-5	M-11	Z-4
13	M-11	B-6	Z-4	B-5	M-11	Z-3
14	M-11	B-6	M-6	B-5	M-11	Z-3
15	B-3	M-4	Z-4	B-5	M-11	Z-3
16	B-3	M-4	Z-4	B-5	M-11	Z-3
17	B-3	M-4	Z-4	B-5	Z-2	B-3
18	B-3	M-4	Z-4	B-5	Z-3	B-3
19	B-3	M-4	Z-4	M-4	Z-2	B-3
20	B-3	M-4	Z-4	B-5	Z-2	B-3
21	B-3	M-2	B-3	B-5	Z-2	B-3
22	M-4	M-2	B-3	B-5	Z-2	M-9
23	M-4	M-2	B-2	B-5	Z-2	M-10
24	M-1	M-2	B-2	M-4	Z-4	Z-4
25	Z-1	B-6	B-2	M-10	M-1	Z-4
26	M-1	B-1	B-2	M-10	M-2	Z-4
27	Z-3	B-1	B-2	M-1	M-6	Z-4
28	M-1	B-1	Z-4	M-4	M-6	Z-4
29	M-4	B-3	Z-4	M-4	B-5	Z-4
30	B-1	B-3	Z-4	M-1	B-5	Z-4
31	B-1	B-3	M-12	M-1	B-5	Z-4

February 1956

DATE	SECTOR					
	I	II	III	IV	V	VI
1	B-3	M-4	M-12	M-4	B-5	Z-4
2	B-3	M-4	M-12	M-1	B-5	Z-4
3	Z-1	M-4	M-12	M-4	B-5	Z-4
4	Z-1	M-4	M-12	B-4	M-13	B-3
5	Z-1	M-4	Z-4	B-4	M-13	B-3
6	Z-1	B-3	Z-4	B-4	Z-4	B-3
7	Z-1	B-3	M-12	B-4	Z-4	B-3
8	Z-1	B-3	M-12	B-1	M-2	B-3
9	Z-1	B-3	M-12	B-1	M-13	B-3
10	Z-1	B-3	Z-4	B-1	M-13	B-3
11	Z-1	B-3	Z-4	B-1	M-13	B-3
12	M-2	B-6	M-4	B-1	M-4	B-3
13	M-2	M-8	Z-1	B-1	M-4	B-3
14	Z-1	M-9	Z-1	B-2	M-4	B-3
15	Z-1	M-10	Z-1	B-2	M-4	B-3
16	M-4	B-4	Z-1	B-2	M-11	B-3
17	M-1	B-4	M-4	B-2	M-4	B-3
18	M-4	B-4	Z-3	B-1	M-4	B-3
19	M-11	B-6	Z-1	B-1	M-4	B-3
20	M-4	B-6	Z-1	B-1	B-6	M-8
21	Z-1	B-6	M-6	B-1	B-6	Z-1
22	M-4	B-6	M-6	B-1	Z-4	Z-3
23	M-11	B-4	M-6	B-1	Z-4	Z-3
24	M-1	B-4	M-6	B-1	Z-4	Z-3
25	M-2	B-4	Z-1	M-4	Z-4	Z-3
26	Z-1	B-4	Z-1	M-10	M-13	B-1
27	Z-1	B-4	Z-1	M-4	M-13	B-1
28	B-3	M-6	M-1	B-2	M-13	Z-3
29	B-3	M-5	M-1	B-2	M-13	Z-3

March 195[illegible]

DATE	SECTOR I	II	III	IV	V	VI
1	B-3	M-4	Z-1	M-10	M-13	Z-4
2	B-3	M-5	M-2	B-2	M-13	Z-2
3	B-3	M-6	Z-1	B-4	M-3	Z-2
4	M-2	M-6	Z-1	B-4	M-3	Z-4
5	Z-1	M-7	Z-1	B-4	Z-2	Z-4
6	M-7	M-5	Z-1	B-4	M-2	Z-4
7	M-7	Z-4	M-1	B-3	M-2	B-1
8	Z-1	M-8	M-2	B-3	B-4	B-1
9	Z-1	M-8	Z-1	M-6	B-4	B-1
10	Z-1	B-3	Z-1	M-11	B-5	B-1
11	Z-1	B-2	Z-1	M-11	B-5	Z-3
12	Z-1	B-2	M-12	M-5	B-5	Z 3
13	Z-1	B-2	M-12	M-11	B-5	Z 3
14	Z-1	B-3	M-12	M-11	B-5	Z 3
15	Z-1	M-4	M-12	M-11	B-5	Z-3
16	M-4	M-4	Z-4	M-11	B-6	Z-3
17	Z-4	Z-4	M-6	M-11	B-6	Z-3
18	M-4	Z-4	M-6	Z-2	B-6	Z-3
19	Z-4	Z-4	M-6	Z-2	B-6	Z-3
20	Z-4	Z-4	Z-4	Z-2	B-6	Z-3
21	B-3	M-3	[illegible]-3	M-6	B-6	Z-3
22	B-3	M-2	B-3	Z-3	B-6	Z-3
23	B-3	M-2	B-3	Z-3	B-6	Z-3
24	Z-3	B-6	M-6	Z-3	B-6	Z-3
25	Z-3	B-6	M-6	M-6	B-6	Z-3
26	Z-3	B-5	M-6	M-7	B-6	Z-4
27	Z-3	B-1	M-7	B-3	B-6	Z-4
28	Z-3	B-1	Z-4	M-11	B-4	Z-4
29	3	B-1	Z-4	M-11	B-4	Z-4
30	3	B-1	[illegible]-1	B-1	Z-4	Z-4
31	Z 3	B-4	M-7	B-1	M-13	M-9

January 1957

DATE	SECTOR I	II	III	IV	V	VI
1	Z-1	M-4	M-6	M-10	B-6	Z-3
2	Z-1	M-10	M-6	M-10	B-6	Z-3
3	Z-1	M-9	M-12	M-4	B-6	Z-4
4	Z-1	B-4	M-12	M-4	B-6	Z-3
5	Z-1	B-4	M-12	B-2	M-13	Z-4
6	Z-1	B-4	Z-4	B-2	M-13	Z-3
7	Z-1	B-4	Z-3	B-2	M-13	Z-3
8	M-7	B-4	Z-3	M-6	M-13	Z-4
9	Z-4	B-5	Z-3	M-7	M-13	Z-4
10	Z-4	B-5	Z-3	B-2	M-13	Z-4
11	Z-4	B-5	Z-3	B-2	M-13	Z-4
12	M-2	B-5	Z-3	B-2	Z-4	Z-4
13	M-6	B-5	M-12	B-1	M-13	Z-4
14	M-6	B-5	M-12	B-1	M-13	Z-4
15	M-6	B-6	Z-4	B-1	M-13	Z-4
16	M-11	B-6	M-2	B-1	M-13	Z-4
17	M-11	B-6	M-2	B-2	M-13	Z-4
18	M-11	B-6	M-3	B-2	M-13	Z-4
19	M-11	B-6	M-12	M-10	M-13	Z-4
20	M-11	B-6	Z-2	M-4	B-1	M-10
21	Z-1	B-6	Z-2	M-2	B-1	M-10
22	Z-1	B-6	Z-2	M-11	B-1	M-10
23	M-7	B-6	Z-2	M-6	B-1	Z-3
24	M-6	B-6	Z-3	M-7	Z-4	Z-3
25	M-6	B-5	Z-3	M-4	B-5	Z-3
26	M-7	B-5	Z-3	Z-2	B-5	Z-1
27	M-4	B-4	Z-2	M-4	B-5	Z-3
28	M-6	B-4	Z-2	M-1	B-5	Z-3
29	M-7	B-4	Z-3	M-1	M-13	Z-3
30	M-4	B-3	Z-3	M-1	M-6	Z-4
31	M-4	B-3	Z-3	M-2	M-6	Z-4

February 1957

DATE	SECTOR					
	I	II	III	IV	V	VI
1	[illegible]-11	B-3	Z-4	M-2	M-13	Z-3
2	[illegible]-2	B-5	Z-2	M-2	M-13	Z-4
3	[illegible]-3	B-5	Z-2	[illegible]-2	M-13	Z-4
4	M-3	B-5	Z-2	M-6	M-6	Z-4
5	[illegible]-3	B-5	Z-2	Z-4	M-6	Z-3
6	Z-2	B-5	Z-2	M-2	M-6	Z-1
7	M-7	B-5	Z-2	M-2	Z-4	Z-1
8	Z-4	B-4	Z-2	B-5	Z-4	Z-1
9	Z-4	B-4	Z-2	B-5	Z-4	Z-4
10	Z-1	B-4	Z-2	B-5	Z-4	Z-4
11	B-3	B-4	Z-2	B-5	Z-4	Z-4
12	B-3	Z-2	M-6	B-5	Z-4	Z-4
13	B-1	Z-2	B-1	Z-2	Z-4	Z-4
14	B-1	M-4	B-1	Z-2	Z-4	Z-4
15	B-1	M-4	B-1	Z-2	M-1	Z-4
16	Z-1	B-3	B-1	Z-1	M-4	Z-4
17	Z-1	B-3	M-1	Z-4	M-4	Z-4
18	Z-1	B-5	M-1	M-6	M-4	Z-4
19	Z-1	B-5	B-2	M-7	M-4	Z-4
20	Z-1	B-6	B-2	M-4	M-4	Z-4
21	Z-1	B-6	M-2	Z-4	M-4	Z-4
22	Z-1	B-6	B-1	M-4	M-4	Z-4
23	B-3	B-6	[illegible]-4	M-4	M-1	Z-4
24	B-3	Z-4	M-1	M-4	M-2	Z-4
25	B-3	Z-4	M-1	M-1	B-2	Z-4
26	B-3	M-1	M-2	M-2	B-2	Z-4
27	B-3	M-11	Z-4	M-5	B-2	Z-4
28	Z-1	M-11	Z-4	M-2	B-2	M-8

March 1957

DATE	SECTOR					
	I	II	III	IV	V	VI
1	Z-1	M-4	M-12	B-5	M-13	Z-4
2	Z-1	B-5	M-12	B-5	M-13	Z-4
3	Z-1	B-5	Z-1	B-6	M-13	Z-4
4	Z-4	B-5	Z-4	B-6	M-13	Z-4
5	Z-1	B-5	M-2	B-6	M-6	Z-4
6	Z-1	B-5	M-2	B-5	M-6	M-8
7	Z-1	B-5	M-6	B-5	B-3	M-8
8	B-3	M-6	M-5	B-5	B-3	M-8
9	B-3	[illegible]-6	M-6	B-5	B-3	Z-4
10	[illegible]-3	Z-2	M-7	B-5	B-3	Z-4
11	B-3	[illegible]	M-7	B-5	B-4	Z-4
12	M-2	M-[illegible]	Z-3	B-5	B-4	Z-4
13	Z-1	Z-4	Z-1	B-5	B-3	Z-4
14	Z-1	M-6	M-5	B-5	M-6	Z-4
15	M-6	M-6	M-5	M-4	Z-4	Z-4
16	M-3	M-6	M-5	M-4	M-6	Z-4
17	Z-1	M-6	M-12	Z-4	M-3	Z-4
18	Z-1	M-6	M-12	M-4	M-3	M-9
19	Z-1	M-5	M-12	M-12	M-6	M-9
20	Z-1	B-2	M-12	M-12	M-6	M-10
21	M-2	B-2	Z-4	M-6	Z-4	M-10
22	M-3	B-2	Z-4	M-7	Z-4	M-4
23	Z-1	B-2	M-7	M-10	B-4	M-4
24	Z-1	Z-4	Z-4	Z-4	B-6	M-10
25	Z-1	Z-4	B-2	B-5	B-6	M-10
26	Z-1	Z-4	B-2	B-5	B-6	M-10
27	Z-1	Z-4	B-2	B-6	B-6	M-10
28	Z-1	M-2	B-2	B-6	B-6	Z-4
29	Z-1	B-5	B-2	M-2	B-3	M-9
30	M-7	B-5	Z-4	Z-1	B-3	M-10
31	M-4	M-4	Z-4	M-4	B-6	M-10

APPENDIX II

Contingency Tables

SPACE CORRELATION

BASE SECTOR II CORRELATED AGAINST SELECTED SECTOR I

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	198	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	198
Z2	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25
Z3	-	-	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49
Z4	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
M1	-	-	-	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23
M2	-	-	-	-	-	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27
M3	-	-	-	-	-	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	23
M4	-	-	-	-	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	30
M5	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
M6	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	9
M7	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	18
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M9	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	4
M11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	-	-	-	-	-	25
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
B1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	15
B2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	17
B3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73	73
Total Types	198	25	49	3	23	27	23	30	1	9	18	-	2	4	25	-	-	15	17	73	542 Total Cases

SPACE CORRELATION

BASE SECTOR I CORRELATED AGAINST SELECTED SECTOR II

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	3	6	6	6	4	3	-	21	3	3	4	3	7	15	1	-	2	12	12	20	18	28	21	198
Z2	-	2	-	-	1	-	-	5	1	2	-	1	-	-	-	-	-	1	-	4	6	2	-	25
Z3	-	1	1	1	-	2	-	3	-	3	-	-	-	1	1	-	-	6	-	3	13	10	4	49
Z4	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	3
M1	-	3	-	-	-	1	-	-	2	-	-	-	1	1	-	-	-	3	1	1	4	3	3	23
M2	-	1	-	-	-	-	-	-	1	4	-	1	1	1	-	-	-	1	2	4	4	5	2	27
M3	-	1	-	-	-	-	-	-	2	6	-	-	-	-	-	-	-	-	2	-	8	4	-	23
M4	-	2	2	-	1	2	-	2	-	-	2	-	-	-	-	-	-	1	2	9	6	1	-	30
M5	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
M6	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	1	2	2	1	9
M7	-	1	1	-	-	-	-	-	2	-	-	-	-	1	-	-	-	1	-	4	3	3	2	18
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	2
M10	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2	-	-	-	4
M11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	5	16	25
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
B1	-	3	-	-	-	-	-	3	-	-	1	-	-	-	-	-	-	-	-	2	6	-	-	15
B2	1	2	-	-	1	1	-	2	-	3	-	-	-	-	-	-	-	-	-	5	2	-	-	17
B3	2	6	4	3	4	4	3	15	4	4	-	-	-	2	1	-	-	4	7	4	5	-	1	73
Total Types	6	28	14	11	12	13	3	52	15	28	7	5	9	21	3	-	2	30	26	60	84	63	50	542 Total Cases

SPACE CORRELATION

BASE SECTOR I CORRELATED AGAINST SELECTED SECTOR III

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	17	12	19	23	1	13	6	4	7	25	4	1	-	-	-	30	2	4	21	9	198
Z2	3	3	7	-	-	2	-	3	-	2	1	-	-	-	-	3	-	-	1	-	25
Z3	-	-	6	7	4	4	2	2	1	14	4	-	-	-	-	3	-	-	1	1	49
Z4	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
M1	2	1	1	2	-	-	2	2	-	5	1	-	-	-	-	2	-	-	5	-	23
M2	3	2	6	3	-	1	2	1	1	1	1	-	-	-	-	5	-	-	-	1	27
M3	-	4	2	5	-	1	2	1	2	1	-	-	1	-	-	4	-	-	-	-	23
M4	2	1	5	5	1	2	1	2	-	4	4	-	-	-	-	1	-	-	-	2	30
M5	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
M6	-	1	2	-	-	1	-	-	1	-	1	1	-	-	-	-	-	-	2	-	9
M7	1	3	3	2	2	2	1	1	-	-	1	-	-	-	-	2	-	-	-	-	18
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M9	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
M10	1	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	4
M11	1	4	5	1	-	2	1	-	-	7	-	-	-	-	-	1	-	-	3	-	25
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
B1	1	-	-	2	-	1	-	3	-	1	2	-	-	-	-	2	-	3	-	-	15
B2	-	-	1	-	-	3	3	2	1	3	3	-	-	-	-	1	-	-	-	-	17
B3	2	5	8	15	4	7	2	1	2	11	4	1	-	-	-	3	2	-	2	4	73
Total Types	33	38	66	66	14	40	23	23	15	74	26	3	1	-	-	57	4	7	35	17	542 Total Cases

SPACE CORRELATION

BASE SECTOR I CORRELATED AGAINST SELECTED SECTOR IV

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	2	2	4	4	3	2	1	11	2	2	2	-	1	6	16	1	-	23	28	7	15	34	32	198
Z2	-	-	-	-	-	3	2	-	-	-	1	-	1	-	-	-	-	6	3	1	-	7	1	25
Z3	1	1	2	1	3	-	-	-	-	1	2	-	-	-	5	-	1	4	13	8	3	3	1	49
Z4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	3
M1	-	-	1	-	-	-	1	2	-	-	1	-	-	1	2	-	-	4	6	2	-	1	2	23
M2	-	-	1	-	-	1	-	2	-	1	-	-	-	-	1	-	-	9	4	2	2	4	-	27
M3	-	-	1	1	-	1	-	3	-	2	1	-	-	-	2	1	-	2	4	3	-	1	1	23
M4	-	1	-	2	1	1	-	3	-	-	-	-	-	-	1	-	-	6	4	2	1	8	-	30
M5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
M6	-	-	1	-	1	-	-	2	-	-	1	-	-	-	2	-	-	-	-	2	-	-	-	9
M7	1	1	-	-	2	1	-	4	-	1	-	-	-	1	1	-	-	-	2	2	1	1	-	18
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	1	-	4
M11	-	1	-	-	-	1	-	1	-	2	-	-	-	1	2	-	-	3	4	-	1	9	-	25
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
B1	-	3	-	-	2	-	-	1	-	-	-	-	-	-	1	-	-	-	1	-	3	4	-	15
B2	-	-	-	-	-	-	-	2	-	-	-	-	-	-	2	-	-	2	2	2	3	4	-	17
B3	-	1	3	5	2	2	-	7	2	1	-	1	-	3	5	1	-	3	8	3	10	13	3	73
Total Types	4	11	13	13	14	12	4	38	4	10	8	1	2	12	41	3	1	63	83	32	39	94	40	542 Total Cases

SPACE CORRELATION

BASE SECTOR I CORRELATED AGAINST SELECTED SECTOR V

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	4	2	3	28	8	5	2	15	-	9	3	-	-	-	11	3	46	2	9	12	4	11	21	198
Z2	-	-	-	3	-	-	-	-	-	2	-	-	-	-	8	2	2	-	2	-	1	2	3	25
Z3	1	-	-	4	-	3	-	2	-	1	-	-	-	-	3	1	14	1	1	-	11	-	7	49
Z4	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3
M1	-	-	-	8	-	1	1	1	-	1	-	-	-	-	2	1	2	-	1	2	1	-	2	23
M2	-	-	2	8	1	-	1	3	-	-	-	-	-	-	-	1	7	-	-	-	2	1	1	27
M3	1	-	-	2	-	-	3	1	-	4	-	-	-	-	-	1	4	-	-	2	4	1	-	23
M4	-	3	1	3	1	-	-	1	-	2	-	-	-	-	4	2	3	-	2	-	3	2	3	30
M5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
M6	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	5	-	9
M7	-	-	-	4	-	2	-	-	-	-	-	-	-	-	1	-	5	1	-	1	2	2	-	18
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
M10	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	4
M11	1	-	-	2	2	-	-	2	-	1	-	-	-	-	5	-	7	1	-	-	1	3	-	25
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
B1	-	-	-	6	1	-	-	-	-	-	-	-	-	-	-	1	4	-	-	-	1	2	-	15
B2	-	-	-	1	-	-	-	-	-	-	1	-	-	-	2	-	6	-	-	3	2	2	-	17
B3	2	4	4	10	1	2	2	-	-	-	-	-	-	-	2	-	11	-	12	-	2	15	6	73
Total Types	9	9	10	85	15	13	9	25	-	20	4	-	-	-	39	12	113	5	27	20	34	47	46	542 Total Cases

SPACE CORRELATION

BASE SECTOR I CORRELATED AGAINST SELECTED SECTOR VI

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	24	6	37	43	-	-	-	1	-	-	2	12	6	14	-	-	-	5	-	48	198
Z2	1	2	13	7	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	25
Z3	2	5	13	15	-	1	-	-	-	-	-	3	4	-	-	-	-	-	-	6	49
Z4	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
M1	-	2	11	5	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	2	23
M2	1	1	9	10	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	4	27
M3	1	-	8	7	1	-	1	1	-	-	-	-	3	-	-	-	-	-	-	1	23
M4	1	1	7	9	-	-	-	-	-	-	-	-	4	3	-	-	-	-	-	5	30
M5	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
M6	1	1	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	9
M7	2	1	5	1	-	-	-	-	-	-	-	-	-	3	-	-	-	2	-	4	18
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	----
M9	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M10	-	-	1	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	4
M11	3	-	5	8	-	-	-	2	-	-	-	2	-	1	-	-	-	-	-	4	25
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
B1	-	1	-	8	-	-	-	-	-	-	-	1	1	2	-	-	-	-	-	2	15
B2	3	-	3	3	-	-	-	-	-	-	-	1	5	-	-	-	-	-	-	2	17
B3	2	10	21	21	-	-	-	-	-	-	-	4	3	2	-	-	-	-	1	9	73
Total Types	42	30	141	140	1	2	1	4	-	-	2	26	29	26	-	-	-	7	1	90	542 Total Types

SPACE CORRELATION

BASE SECTOR II CORRELATED AGAINST SELECTED SECTOR II

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
Z2	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28
Z3	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14
Z4	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11
M1	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12
M2	-	-	-	-	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
M3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
M4	-	-	-	-	-	-	-	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52
M5	-	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15
M6	-	-	-	-	-	-	-	-	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	28
M7	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	7
M8	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	5
M9	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	9
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	-	-	-	-	-	21
M11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	3
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	2
B1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	-	-	-	-	-	30
B2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26	-	-	-	-	26
B3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60	-	-	-	60
B4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	84	-	-	84
B5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63	-	63
B6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	50
Total Types	6	28	14	11	12	13	3	52	15	28	7	5	9	21	3	-	2	30	26	60	84	63	50	542 Total Cases

SPACE CORRELATION

BASE SECTOR II CORRELATED AGAINST SELECTED SECTOR III

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	-	1	1	-	-	-	2	1	-	1	-	-	-	-	-	-	-	-	-	-	6
Z2	3	-	4	2	-	2	-	2	1	2	5	1	-	-	-	-	1	1	3	1	28
Z3	-	2	-	1	2	-	1	-	2	3	-	-	-	-	-	-	-	-	-	3	14
Z4	1	-	-	2	2	-	-	-	-	2	-	-	-	-	-	-	-	-	4	-	11
M1	-	-	4	-	-	1	1	-	-	1	1	-	-	-	-	1	-	-	-	3	12
M2	-	-	1	1	-	2	-	-	1	-	-	-	-	-	-	1	-	-	1	6	13
M3	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	3
M4	3	1	1	15	-	3	3	2	2	6	2	-	-	-	-	9	-	2	2	1	52
M5	1	-	1	-	1	2	1	2	1	3	2	-	-	-	-	1	-	-	-	-	15
M6	2	-	4	4	-	-	-	-	5	6	2	-	-	-	-	2	-	-	2	1	28
M7	1	-	1	1	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	7
M8	2	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	5
M9	2	-	-	1	-	-	1	1	-	-	-	-	-	-	-	2	1	-	1	-	9
M10	1	2	1	1	-	1	1	1	-	3	3	-	-	-	-	3	-	-	4	-	21
M11	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	3
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	2
B1	1	2	6	2	-	6	2	-	1	5	1	1	-	-	-	-	1	-	2	-	[illegible]0
B2	3	-	-	14	1	4	-	-	-	-	1	-	-	-	-	3	-	-	-	-	26
B3	3	-	7	6	4	6	1	6	-	4	3	-	-	-		17	-	2	1	-	60
B4	6	11	13	8	2	7	6	6	-	9	6	-	-	-	-	7	-	-	2	1	84
B5	1	7	15	4	2	3	1	-	-	11	-	1	1	-	-	9	-	1	7	-	63
B6	3	11	6	3	-	2	2	2	2	10	-	-	-	-	-	2	1	1	5	-	50
Total Types	33	38	66	66	14	40	23	23	15	74	26	3	1	-	-	57	4	7	35	17	542 Total Cases

SPACE CORRELATION

BASE SECTOR II CORRELATED AGAINST SELECTED SECTOR IV

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3	1	-	1	-	-	6
Z2	-	1	-	1	-	-	-	-	-	-	1	-	-	-	4	-	-	3	1	2	1	13	1	28
Z3	-	1	-	-	1	-	-	-	-	-	-	-	-	1	1	-	-	2	1	1	2	1	3	14
Z4	-	2	-	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	3	2	11
M1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	2	-	-	-	6	-	-	1	1	12
M2	1	-	2	2	-	-	-	1	-	-	-	-	-	-	1	-	-	-	3	-	-	3	-	13
M3	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	1	-	3
M4	-	3	-	-	1	1	2	6	-	-	-	1	-	2	4	-	-	4	5	1	9	10	3	52
M5	-	-	-	-	-	-	1	-	-	-	-	-	-	1	2	1	-	1	3	2	1	2	1	15
M6	-	-	-	2	-	-	-	4	-	-	-	-	-	-	2	-	-	3	3	3	2	7	2	28
M7	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	2	1	1	7
M8	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2	-	1	-	-	1	5
M9	-	-	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	1	1	2	1	9
M10	1	-	2	1	-	-	-	1	2	-	-	-	-	1	1	-	-	1	2	3	1	4	1	21
M11	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	3
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	2
B1	-	-	-	-	1	-	1	1	-	-	-	-	1	1	3	1	-	3	12	1	1	3	1	30
B2	-	-	-	2	1	1	-	2	1	1	1	-	-	1	2	1	-	-	-	3	2	6	2	26
B3	1	1	2	1	4	3	-	2	-	-	-	-	-	1	2	-	-	16	3	2	6	14	2	60
B4	-	-	1	3	4	-	-	10	-	3	1	-	-	1	5	-	-	11	17	8	5	9	6	84
B5	1	2	1	-	-	5	-	2	-	2	4	-	1	-	6	-	1	4	15	1	1	7	10	63
B6	-	1	2	-	1	-	-	6	-	2	1	-	-	3	5	-	-	7	10	1	3	6	2	50
Total Types	4	11	13	13	14	12	4	38	4	10	8	1	2	12	41	3	1	63	83	32	39	94	40	542 Total Cases

SPACE CORRELATION

BASE SECTOR II CORRELATED AGAINST SELECTED SECTOR V

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	1	-	6
Z2	1	1	1	4	1	-	1	-	-	-	-	-	-	-	2	3	4	-	-	3	2	5	-	28
Z3	1	-	-	2	-	1	1	-	-	-	-	-	-	-	3	1	2	-	-	-	-	-	3	14
Z4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	-	7	11
M1	-	-	1	3	-	-	-	-	-	-	-	-	-	-	2	-	1	-	1	-	-	3	1	12
M2	-	2	-	2	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	3	4	13
M3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	3
M4	2	4	1	5	2	-	-	4	-	2	-	-	-	-	5	1	11	-	7	-	-	5	3	52
M5	-	-	2	1	-	1	-	2	-	1	-	-	-	-	-	-	3	-	1	-	2	2	-	15
M6	1	-	1	2	1	-	5	1	-	2	-	-	-	-	-	1	4	-	1	2	4	3	-	28
M7	-	1	-	3	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	1	-	-	7
M8	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	2	-	-	5
M9	-	-	-	2	1	-	-	1	-	1	-	-	-	-	-	-	2	-	1	-	-	-	1	9
M10	-	-	-	6	-	1	-	1	-	2	1	-	-	-	1	-	1	-	4	1	1	1	1	21
M11	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	3
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2
B1	-	-	-	8	-	1	-	-	-	2	-	-	-	-	-	-	11	-	-	2	2	1	3	30
B2	-	-	2	3	-	1	1	-	-	2	-	-	-	-	-	-	-	-	2	4	2	3	6	26
B3	-	1	1	13	2	4	-	2	-	2	1	-	-	-	9	1	12	-	5	-	-	7	-	60
B4	2	-	1	11	4	1	-	3	-	1	-	-	-	-	8	3	20	1	3	-	16	5	5	84
B5	1	-	-	11	1	1	-	2	-	5	1	-	-	-	2	1	20	-	-	7	2	2	7	63
B6	-	-	-	3	3	-	1	7	-	-	-	-	-	-	6	1	16	4	-	-	-	5	4	50
Total Types	9	9	10	85	15	13	9	25	-	20	4	-	-	-	39	12	113	5	27	20	34	47	46	542 Total Cases

SPACE CORRELATION

BASE SECTOR II CORRELATED AGAINST SELECTED SECTOR VI

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	1	-	1	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	6
Z2	-	1	9	11	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-	4	28
Z3	1	1	3	3	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	4	14
Z4	-	-	2	4	-	-	-	-	-	-	-	1	-	4	-	-	-	-	-	-	11
M1	4	2	1	3	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	12
M2	2	-	5	2	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	2	13
M3	-	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3
M4	1	-	9	19	-	1	-	-	-	-	-	3	-	3	-	-	-	-	-	16	52
M5	3	2	4	3	-	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-	15
M6	2	1	7	9	-	-	-	-	-	-	1	1	5	1	-	-	-	-	-	1	28
M7	1	-	2	2	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	7
M8	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	5
M9	1	-	1	3	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2	9
M10	3	-	4	3	-	-	-	-	-	-	1	-	-	1	-	-	-	-	1	8	21
M11	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
B1	1	1	13	7	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	6	30
B2	-	1	11	6	-	-	-	2	-	-	-	3	-	3	-	-	-	-	-	-	26
B3	2	5	11	14	-	-	-	-	-	-	-	2	9	3	-	-	-	1	-	13	60
B4	5	7	33	13	1	-	-	-	-	-	-	5	4	1	-	-	-	2	-	13	84
B5	6	8	11	19	-	1	1	-	-	-	-	5	2	2	-	-	-	-	-	8	63
B6	7	-	13	14	-	-	-	2	-	-	-	2	1	3	-	-	-	-	-	8	50
Total Types	42	30	141	140	1	2	1	4	-	-	2	26	29	26	-	-	-	7	1	90	542 Total Cases

SPACE CORRELATION

BASE SECTOR III CORRELATED AGAINST SELECTED SECTOR III

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33
Z2	-	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38
Z3	-	-	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66
Z4	-	-	-	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66
M1	-	-	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14
M2	-	-	-	-	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40
M3	-	-	-	-	-	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	23
M4	-	-	-	-	-	-	-	23	-	-	-	-	-	-	-	-	-	-	-	-	23
M5	-	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	15
M6	-	-	-	-	-	-	-	-	-	74	-	-	-	-	-	-	-	-	-	-	74
M7	-	-	-	-	-	-	-	-	-	-	26	-	-	-	-	-	-	-	-	-	26
M8	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	3
M9	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	57	-	-	-	-	57
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	4
B1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	7
B2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	-	35
B3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	17
Total Types	33	38	66	66	14	40	23	23	15	74	26	3	1	-	-	57	4	7	35	17	542 Total Cases

SPACE CORRELATION

BASE SECTOR III CORRELATED AGAINST SELECTED SECTOR VI

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	-	-	-	-	-	-	2	3	-	1	-	-	-	2	2	-	-	3	5	-	4	9	2	33
Z2	-	-	1	-	2	4	-	3	-	2	-	-	-	-	5	-	-	3	8	-	4	5	1	38
Z3	-	2	-	-	2	2	-	3	-	3	3	-	2	-	6	-	1	12	13	1	3	8	5	66
Z4	1	2	1	7	2	1	-	8	1	1	1	-	-	-	3	-	-	4	9	5	7	12	1	66
M1	-	-	-	-	1	1	-	1	-	-	-	-	-	1	-	-	-	1	4	1	2	2	-	14
M2	1	-	1	-	-	1	-	1	-	-	-	-	-	-	1	-	-	6	12	2	5	6	4	40
M3	-	1	2	-	1	-	-	1	-	-	-	-	-	1	2	-	-	5	4	3	1	2	-	23
M4	-	1	-	-	1	-	-	2	-	-	1	-	-	-	2	-	-	3	2	6	3	2	-	23
M5	-	-	-	1	1	-	-	2	-	-	-	-	-	1	1	-	-	1	3	1	2	2	-	15
M6	-	2	2	1	-	1	2	2	-	1	1	-	-	2	3	-	-	13	9	7	2	19	7	74
M7	-	-	1	1	-	-	-	2	2	-	-	-	-	2	2	-	-	2	2	5	-	7	-	26
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	3
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M12	-	-	-	1	3	1	-	7	1	-	-	1	-	1	7	2	-	10	6	1	3	11	2	57
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	-	1	4
B1	1	3	1	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	7
B2	1	-	2	-	1	1	-	2	-	-	2	-	-	2	6	-	-	-	-	-	-	5	13	35
B3	-	-	2	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	5	-	-	3	4	17
Total Types	4	11	13	13	14	12	4	38	4	10	8	1	2	12	41	3	1	63	83	32	39	94	40	542 Total Cases

SPACE CORRELATION

BASE SECTOR III CORRELATED AGAINST SELECTED SECTOR V

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	1	1	-	1	3	1	3	4	-	3	-	-	-	-	3	-	7	-	-	2	1	2	1	33
Z2	-	-	1	9	-	-	-	2	-	4	-	-	-	-	1	1	6	4	-	-	-	8	2	38
Z3	2	-	-	15	-	-	-	2	-	3	1	-	-	-	-	2	27	-	1	4	3	5	1	66
Z4	-	4	1	6	2	3	-	2	-	1	1	-	-	-	7	1	7	-	6	5	6	3	11	66
M1	1	-	-	2	-	2	1	1	-	-	-	-	-	-	2	-	3	-	1	-	-	-	1	14
M2	-	-	3	2	1	1	-	-	-	2	-	-	-	-	-	-	15	-	4	-	2	6	4	40
M3	1	-	-	7	-	1	-	1	-	-	1	-	-	-	-	-	4	-	-	-	5	1	2	23
M4	-	-	-	3	1	-	-	2	-	-	-	-	-	-	7	1	3	-	-	-	4	2	-	23
M5	1	-	-	2	-	-	1	1	-	2	-	-	-	-	1	-	3	-	1	1	1	1	-	15
M6	3	-	3	16	2	1	1	-	-	1	-	-	-	-	7	2	13	-	6	2	6	1	10	74
M7	-	1	1	3	-	1	-	-	-	-	-	-	-	-	2	2	3	-	2	1	4	5	1	26
M8	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	3
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M12	-	1	-	12	2	2	2	2	-	2	-	-	-	-	3	2	11	1	4	1	2	8	2	57
M13	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	4
B1	-	-	-	2	1	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
B2	-	-	-	3	3	1	-	3	-	2	1	-	-	-	2	1	6	-	1	3	-	4	5	35
B3	-	2	-	1	-	-	1	1	-	-	-	-	-	-	4	-	-	-	1	-	-	1	6	17
Total Types	9	9	10	85	15	13	9	25	-	20	4	-	-	-	39	12	113	5	27	20	34	47	46	542 Total Cases

SPACE CORRELATION

BASE SECTOR III CORRELATED AGAINST SELECTED SECTOR VI

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	-	1	7	7	-	-	-	-	-	-	-	3	1	-	-	-	-	5	-	9	33
Z2	6	2	10	10	-	-	-	-	-	-	-	1	-	3	-	-	-	-	-	6	38
Z3	6	3	26	17	1	1	-	-	-	-	-	3	4	2	-	-	-	-	-	3	66
Z4	2	2	14	18	-	-	-	1	-	-	1	7	3	8	-	-	-	-	-	10	66
M1	2	-	2	4	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	4	14
M2	2	8	12	7	-	-	-	1	-	-	-	2	3	-	-	-	-	1	-	4	40
M3	2	1	9	2	-	-	-	1	-	-	-	-	3	-	-	-	-	-	-	5	23
M4	2	-	6	6	-	1	-	-	-	-	-	2	2	-	-	-	-	-	-	4	23
M5	-	-	6	7	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	15
M6	7	4	23	18	-	-	-	-	-	-	-	5	4	2	-	-	-	-	-	11	74
M7	3	1	2	7	-	-	-	1	-	-	1	1	3	2	-	-	-	-	1	4	26
M8	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3
M9	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M12	2	8	10	19	-	-	-	-	-	-	-	1	3	4	-	-	-	-	-	10	57
M13	1	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	4
B1	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
B2	2	-	9	9	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-	11	35
B3	5	-	5	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	5	17
Total Types	42	30	141	140	1	2	1	4	-	-	2	26	29	26	-	-	-	7	1	90	542 Total Cases

SPACE CORRELATION

BASE SECTOR IV CORRELATED AGAINST SELECTED SECTOR IV

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Z2	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11
Z3	-	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
Z4	-	-	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
M1	-	-	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14
M2	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12
M3	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
M4	-	-	-	-	-	-	-	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38
M5	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
M6	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	10
M7	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	8
M8	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
M9	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	12
M11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	41	-	-	-	-	-	-	-	-	41
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	3
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
B1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63	-	-	-	-	-	63
B2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	83	-	-	-	-	83
B3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	-	-	-	32
B4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	-	-	39
B5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	94	-	94
B6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	40
Total Types	4	11	13	13	14	12	4	38	4	10	8	1	2	12	41	3	1	63	83	32	39	94	40	542 Total Cases

SPACE CORRELATION

BASE SECTOR IV CORRELATED AGAINST SELECTED SECTOR V

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	-	-	-	1	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	4
Z2	-	-	-	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	2	4	11
Z3	-	-	-	3	-	-	-	2	-	1	2	-	-	-	1	-	-	-	1	-	-	-	3	13
Z4	-	-	-	1	1	2	1	-	-	-	-	-	-	-	-	-	-	-	1	1	1	4	1	13
M1	-	-	-	1	-	-	-	-	-	2	-	-	-	-	1	-	1	1	1	-	2	4	1	14
M2	-	-	-	1	-	-	1	-	-	2	-	-	-	-	2	-	3	-	2	1	-	-	-	12
M3	-	-	-	1	-	-	-	-	-	1	-	-	-	-	1	-	-	-	1	-	-	-	-	4
M4	-	1	-	5	3	2	1	3	-	2	-	-	-	-	2	-	5	1	1	-	2	6	4	38
M5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	1	-	4
M6	1	-	-	1	-	-	-	1	-	2	-	-	-	-	-	-	1	1	-	-	1	-	2	10
M7	1	-	-	2	-	-	-	1	-	-	-	-	-	-	1	-	1	-	1	-	-	-	1	8
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	2
M10	1	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	5	-	-	-	1	1	2	12
M11	-	-	-	3	-	-	-	-	-	-	1	-	-	-	-	-	-	2	1	7	5	20	2	41
M12	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	3
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
B1	4	-	1	16	1	2	-	5	-	-	1	-	-	-	6	3	18	-	2	-	-	-	4	63
B2	-	-	1	13	1	1	2	7	-	1	-	-	-	-	9	-	38	-	-	-	-	6	4	83
B3	-	-	-	2	-	2	-	-	-	-	-	-	-	-	-	-	4	-	2	-	18	1	3	32
B4	1	1	-	4	-	3	2	-	-	-	-	-	-	-	-	2	18	-	3	-	-	2	3	39
B5	1	7	5	21	4	-	1	5	-	5	-	-	-	-	11	3	4	-	6	9	4	-	8	94
B6	-	-	3	7	3	-	1	-	-	2	-	-	-	-	3	4	14	-	-	-	-	-	3	40
Total Types	9	9	10	85	15	13	9	25	-	20	4	-	-	-	39	12	113	5	27	20	34	47	46	542 Total Cases

SPACE CORRELATION

BASE SECTOR IV CORRELATED AGAINST SELECTED SECTOR VI

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	1	-	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	4
Z2	2	-	3	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11
Z3	3	-	7	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
Z4	-	-	4	5	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	1	13
M1	-	2	2	7	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	14
M2	2	-	3	5	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	12
M3	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4
M4	4	1	7	14	-	-	-	-	-	-	-	3	3	2	-	-	-	1	-	3	38
M5	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	4
M6	-	-	3	3	-	-	-	-	-	-	-	2	-	1	-	-	-	1	-	-	10
M7	-	-	2	3	-	-	-	1	-	-	-	2	-	-	-	-	-	-	-	-	8
M8	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
M9	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
M10	-	-	3	4	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	2	12
M11	3	6	20	5	-	1	1	-	-	-	-	-	-	3	-	-	-	1	-	1	41
M12	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	1	3
M13	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
B1	6	1	16	10	-	-	-	-	-	-	-	1	11	1	-	-	-	-	-	17	63
B2	7	10	20	16	1	-	-	2	-	-	-	2	7	1	-	-	-	-	-	17	83
B3	3	-	19	2	-	-	-	-	-	-	2	3	1	-	-	-	-	2	-	-	32
B4	4	4	3	10	-	-	-	-	-	-	-	5	-	1	-	-	-	1	-	11	39
B5	6	4	16	34	-	-	-	-	-	-	-	7	4	9	-	-	-	-	-	14	94
B6	1	-	9	9	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	20	40
Total Types	42	30	141	140	1	2	1	4	-	-	2	26	29	26	-	-	-	7	1	90	542 Total Cases

SPACE CORRELATION

BASE SECTOR V CORRELATED AGAINST SELECTED SECTOR V

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9
Z2	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9
Z3	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
Z4	-	-	-	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	85
M1	-	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15
M2	-	-	-	-	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
M3	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9
M4	-	-	-	-	-	-	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25
M5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M6	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	20
M7	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	4
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	-	-	-	-	-	-	-	-	39
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	12
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	113	-	-	-	-	-	-	113
B1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	5
B2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	-	-	-	-	27
B3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	20
B4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34	-	-	34
B5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47	-	47
B6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	46
Total Types	9	9	10	85	15	13	9	25	-	20	4	-	-	-	39	12	113	5	27	20	34	47	46	542 Total Cases

SPACE CORRELATION

BASE SECTOR V CORRELATED AGAINST SELECTED SECTOR VI

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	1	-	1	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	4	9
Z2	-	-	-	1	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	5	9
Z3	3	-	-	5	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	10
Z4	4	4	22	29	1	-	-	1	-	-	-	-	5	6	-	-	-	-	-	13	85
M1	-	-	-	5	-	-	-	-	-	-	-	3	-	1	-	-	-	-	-	6	15
M2	3	-	1	3	-	-	-	-	-	-	-	1	-	1	-	-	-	2	-	2	13
M3	-	1	-	4	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3	9
M4	2	-	4	8	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	9	25
M5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M6	1	-	1	9	-	-	-	-	-	-	-	4	1	1	-	-	-	-	-	3	20
M7	2	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	4
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M11	6	-	9	12	-	-	-	-	-	-	-	1	4	1	-	-	-	-	-	6	39
M12	-	-	1	5	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	5	12
M13	9	4	24	27	-	1	-	2	-	-	-	4	9	2	-	-	-	2	-	29	113
B1	-	1	1	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	5
B2	2	5	6	7	-	-	-	-	-	-	1	2	-	-	-	-	-	-	1	3	27
B3	-	-	11	4	-	-	1	-	-	-	-	2	1	1	-	-	-	-	-	-	20
B4	-	5	19	6	-	-	-	1	-	-	-	1	-	-	-	-	-	2	-	-	34
B5	4	7	20	9	-	1	-	-	-	-	1	-	2	1	-	-	-	1	-	1	47
B6	5	3	21	5	-	-	-	-	-	-	-	4	2	6	-	-	-	-	-	-	46
Total Types	42	30	141	140	1	2	1	4	-	-	2	26	29	26	-	-	-	7	1	90	542 Total Cases

SPACE CORRELATION

BASE SECTOR VI CORRELATED AGAINST SELECTED SECTOR VI

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42
Z2	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30
Z3	-	-	141	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	141
Z4	-	-	-	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	140
M1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
M2	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
M3	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
M4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	4
M5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M7	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2
M8	-	-	-	-	-	-	-	-	-	-	-	26	-	-	-	-	-	-	-	-	26
M9	-	-	-	-	-	-	-	-	-	-	-	-	29	-	-	-	-	-	-	-	29
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	26	-	-	-	-	-	-	26
M11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
B1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	7
B2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
B3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	90	90
Total Types	42	30	141	140	1	2	1	4	-	-	2	26	29	26	-	-	-	7	1	90	542 Total Cases

TIME CORRELATION BASE DAY PLUS 1

BASE SECTOR I CORRELATED AGAINST SELECTED SECTOR I

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	131	3	4	-	8	7	5	6	-	2	5	-	-	-	3	-	-	-	1	10	185
Z2	3	8	3	-	1	-	-	1	-	-	1	-	2	-	-	-	-	-	-	-	19
Z3	8	2	18	1	1	2	1	2	-	-	-	-	-	1	2	-	-	-	1	1	40
Z4	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3
M1	7	1	1	-	2	5	1	3	-	-	-	-	-	-	2	-	-	-	-	1	23
M2	8	-	1	-	-	6	7	1	-	2	-	-	-	-	1	-	-	-	-	-	26
M3	7	3	1	-	2	-	6	1	-	-	2	-	-	1	-	-	-	-	-	-	23
M4	2	-	4	-	6	1	1	4	-	1	2	-	-	1	2	-	-	1	-	2	27
M5	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
M6	-	1	1	-	-	-	1	-	-	2	3	-	-	-	-	-	-	-	1	-	9
M7	3	-	1	1	-	-	-	6	1	1	4	-	-	-	-	-	-	-	-	-	17
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M9	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	2
M10	-	1	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	4
M11	4	-	1	-	2	2	-	-	-	-	-	-	-	-	14	-	-	-	1	1	25
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
B1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	1	11
B2	2	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	12	1	17
B3	6	-	3	-	-	2	-	1	-	1	-	-	-	-	-	-	-	2	1	50	66
Total Types	183	20	41	3	23	26	23	27	1	9	17	-	2	3	24	-	-	11	17	68	498 Total Cases

TIME CORRELATION BASE DAY PLUS 1

BASE SECTOR I CORRELATED AGAINST SELECTED SECTOR II

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	4	6	4	3	5	2	-	22	3	7	3	3	6	12	-	-	2	11	11	18	21	21	21	185
Z2	-	2	-	-	-	-	-	2	-	2	1	-	-	1	-	-	-	2	-	3	4	2	-	19
Z3	-	1	2	1	1	2	-	2	1	1	-	-	-	1	2	-	-	1	-	2	11	10	2	40
Z4	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	3
M1	-	2	-	-	-	-	-	-	-	1	-	-	1	1	-	-	-	2	1	3	5	4	3	23
M2	-	-	1	1	-	1	-	-	-	1	1	1	1	-	-	-	-	1	2	5	5	4	2	26
M3	-	-	-	-	-	-	-	-	3	2	-	-	-	-	-	-	-	-	3	1	8	5	1	23
M4	-	1	1	1	-	2	-	-	3	2	-	-	-	1	-	-	-	1	1	8	4	-	2	27
M5	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
M6	-	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	3	3	-	[illegible]
M7	-	-	1	-	-	-	-	2	-	-	1	1	-	1	-	-	-	1	-	4	3	1	2	17
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	2
M10	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	2	-	-	-	4
M11	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	3	5	15	25
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
B1	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	2	6	-	-	11
B2	1	2	-	-	1	-	-	1	-	3	-	-	-	1	-	-	-	-	-	6	2	-	-	17
B3	1	6	4	2	4	3	1	13	3	5	-	-	1	3	1	-	-	3	5	5	5	-	1	66
Total Types	6	21	13	8	11	12	2	46	14	26	6	5	9	21	3	-	2	23	24	59	83	55	49	498 Total Cases

TIME CORRELATION BASE DAY PLUS 1

BASE SECTOR II CORRELATED AGAINST SELECTED SECTOR II

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	1	1	1	-	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	6
Z2	-	8	-	-	1	1	-	2	-	3	-	1	2	-	-	-	-	-	1	1	-	1	-	21
Z3	1	-	4	1	-	-	1	3	-	-	1	1	-	-	-	-	-	-	1	-	-	-	-	13
Z4	1	-	-	3	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	7
M1	-	1	-	-	4	2	-	1	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	11
M2	1	-	1	-	-	4	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	1	2	11
M3	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
M4	-	-	2	-	-	2	-	27	3	-	1	-	1	3	-	-	-	2	-	4	-	2	-	47
M5	-	1	1	-	1	-	-	1	2	4	1	-	-	-	-	-	1	-	1	1	-	-	-	14
M6	-	2	2	1	-	-	-	-	3	11	2	-	-	3	-	-	-	-	-	1	1	-	1	27
M7	-	-	-	-	-	-	-	1	1	1	-	-	-	1	-	-	-	-	-	1	1	-	-	6
M8	-	-	-	-	-	-	-	-	-	1	-	1	2	-	-	-	-	-	-	1	-	-	-	5
M9	1	1	-	-	-	-	-	1	-	-	-	-	1	3	-	-	-	-	-	-	2	-	-	9
M10	-	4	1	-	-	1	-	3	-	-	-	-	2	7	-	-	-	-	-	1	2	-	-	21
M11	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	3
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--
M13	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	2
B1	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	19	-	1	1	-	1	24
B2	-	-	-	1	-	-	-	-	1	-	-	-	1	-	-	-	-	-	18	1	1	-	-	23
B3	-	1	-	-	1	-	-	4	-	-	-	-	-	2	-	-	-	-	1	41	6	3	1	60
B4	-	2	-	-	-	-	-	-	4	1	-	1	-	1	-	-	-	-	2	4	64	3	1	83
B5	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	3	44	6	55
B6	-	-	-	2	-	1	-	2	-	-	-	1	-	-	-	-	-	2	-	-	2	1	37	48
Total Types	6	21	13	8	11	12	2	46	14	26	6	5	9	21	3	-	2	23	24	59	83	55	49	498 Total Cases

TIME CORRELATION BASE DAY PLUS 1

BASE SECTOR II CORRELATED AGAINST SELECTED SECTOR III

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	-	1	1	-	1	1	-	-	-	2	-	-	-	-	-	-	-	-	-	-	6
Z2	3	-	3	2	-	1	-	1	1	-	1	-	-	-	-	1	1	2	4	1	21
Z3	-	4	-	2	-	1	-	-	-	3	-	-	-	-	-	-	-	-	-	3	13
Z4	-	-	-	1	1	1	1	-	1	-	-	-	-	-	-	-	-	-	1	1	7
M1	-	-	3	2	-	1	-	-	-	2	-	-	-	-	-	-	-	-	-	3	11
M2	-	-	-	-	-	-	2	-	1	2	-	-	-	-	-	-	-	-	2	4	11
M3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	2
M4	1	1	-	12	-	5	3	1	5	4	1	-	-	-	-	8	-	2	3	1	47
M5	2	-	-	1	2	-	-	1	2	4	1	-	-	-	-	1	-	-	-	-	14
M6	3	-	4	2	-	-	-	1	2	6	3	-	-	-	-	4	-	-	1	1	27
M7	1	-	2	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	1	-	6
M8	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	5
M9	1	-	-	3	-	-	1	2	-	-	-	-	-	-	-	1	-	-	1	-	9
M10	1	1	-	-	-	1	1	2	-	2	5	-	-	-	-	4	1	-	3	-	21
M11	-	-	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	3
M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--
M13	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	2
B1	1	2	3	2	-	5	3	-	1	4	-	1	-	-	-	-	1	-	1	-	24
B2	2	-	-	14	1	1	-	-	-	1	1	-	-	-	-	3	-	-	-	-	23
B3	4	1	6	4	4	8	1	7	-	3	1	-	-	-	-	18	-	2	-	1	60
B4	7	9	16	6	3	5	7	6	-	8	6	-	-	-	-	6	-	-	3	1	83
B5	1	8	12	3	1	3	-	-	1	9	-	1	1	-	-	8	-	-	7	-	55
B6	3	11	6	3	1	4	2	1	1	9	-	-	-	-	-	2	1	1	3	-	48
Total Types	33	38	57	58	14	37	23	22	15	63	20	2	1	-	-	56	4	7	31	17	498 Total Cases

TIME CORRELATION BASE DAY PLUS 1

BASE SECTOR III CORRELATED AGAINST SELECTED SECTOR III

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	Total Types
Z1	17	-	1	4	1	2	-	2	1	2	-	-	-	-	-	2	-	-	-	-	32
Z2	-	23	4	3	1	1	-	-	-	3	1	-	-	-	-	-	2	-	-	-	38
Z3	2	4	31	1	3	7	-	1	1	3	-	-	1	-	-	3	1	-	-	-	58
Z4	1	1	-	30	2	1	-	1	3	6	3	1	-	-	-	7	-	-	2	2	60
M1	-	1	2	-	4	5	-	-	-	1	-	-	-	-	-	-	-	-	-	-	13
M2	4	1	2	1	-	13	7	-	-	6	1	1	-	-	-	-	-	-	-	1	37
M3	-	2	6	2	-	2	7	-	1	2	-	-	-	-	-	1	-	-	-	-	23
M4	2	-	1	1	1	1	-	9	1	-	1	-	-	-	-	5	-	-	-	1	23
M5	-	1	-	-	-	2	-	-	5	5	-	-	-	-	-	1	-	-	-	-	14
M6	4	2	5	6	-	-	7	-	2	28	5	-	-	-	-	2	-	1	1	1	64
M7	1	-	2	3	1	1	-	5	-	-	5	-	-	-	-	2	-	-	-	-	20
M8	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M11	-	-	-	-	-	-	-	-	-	-	-	-	--	-	-	-	-	-	-	-	---
M12	2	2	3	6	1	1	1	2	1	2	2	-	-	-	-	31	-	-	-	1	55
M13	-	1	-	-	-	-	-	1	-	1	-	-	-	-	-	-	1	-	-	-	4
B1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	5	1	-	7
B2	-	-	-	1	-	-	-	-	-	2	2	-	-	-	-	1	-	1	23	-	30
B3	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	4	11	17
Total Types	33	38	57	58	14	37	23	22	15	63	20	2	1	-	-	56	4	7	31	17	498 Total Cases

TIME CORRELATION BASE DAY PLUS 1

BASE SECTOR III CORRELATED AGAINST SELECTED SECTOR IV

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	-	-	-	2	-	-	?	1	1	-	-	-	-	1	[illegible]	-	-	2	9	1	3	7	1	32
Z2	-	-	1	-	3	3	-	-	-	2	1	-	-	-	7	[illegible]	-	3	5	-	4	8	-	38
Z3	-	2	1	-	2	3	-	5	-	2	2	-	-	-	2	-	-	14	14	2	2	4	3	58
Z4	-	-	1	5	4	2	-	4	-	1	1	1	-	1	2	-	-	2	9	6	7	13	1	60
M1	-	-	-	-	1	1	-	1	-	1	-	-	-	-	-	-	1	-	2	1	3	2	-	[illegible]
M2	-	-	1	-	-	-	1	1	1	1	-	-	-	-	3	-	-	3	10	2	4	8	2	37
M3	1	-	3	-	-	-	-	2	-	-	-	-	1	2	-	-	-	3	4	3	2	2	-	[illegible]
M4	-	-	-	1	-	-	-	3	-	-	1	-	-	-	2	-	-	5	-	5	3	3	-	[illegible]
M5	-	-	-	2	-	-	-	4	-	-	-	-	-	-	-	-	-	1	3	1	2	1	-	14
M6	-	5	-	1	-	-	-	2	-	-	-	-	-	4	-	-	-	12	9	4	2	18	7	64
M7	-	-	-	1	1	-	-	3	1	-	-	-	-	-	2	-	-	1	3	3	1	4	-	20
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	2
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---
M12	-	-	-	-	2	-	-	6	1	1	-	-	-	1	7	2	-	11	7	1	3	10	3	55
M13	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	4
B1	1	2	1	-	-	-	-	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	7
N2	1	-	2	-	1	-	-	3	-	-	-	-	-	2	6	-	-	-	-	-	-	3	12	30
B3	-	1	3	-	-	-	-	1	-	-	1	-	-	-	1	-	-	-	4	-	-	1	5	17
Total Types	3	10	13	12	14	9	4	37	4	9	7	1	1	11	35	3	1	57	79	30	39	84	35	498 Total Cases

TIME CORRELATION BASE DAY PLUS 1

BASE SECTOR IV CORRELATED AGAINST SELECTED SECTOR IV

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
[illegible]	-	-	3	-	-	-	-	[illegible]	-	-	-	-	-	-	-	-	-	-	-	-	-	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	4	-	-	-	-	-	1	-	[illegible]	[illegible]	1	1	-	1	-	-	-	-	-	-	-	-	[illegible]
[illegible]	2	-	[illegible]	-	-	1	-	2	-	1	-	-	-	-	1	-	-	-	-	-	-	1	-	[illegible]
[illegible]	-	[illegible]	-	[illegible]	2	1	-	1	-	-	1	-	-	1	1	-	-	-	-	-	-	[illegible]	-	[illegible]
[illegible]	-	-	-	-	4	[illegible]	-	7	-	-	-	-	-	-	1	-	-	-	-	-	-	-	[illegible]	[illegible]
[illegible]	-	-	-	-	-	4	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	[illegible]	-	[illegible]
[illegible]	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-		[illegible]	[illegible]	[illegible]
[illegible]	-	[illegible]	1	2	5	-	-	9	-	-	-	-	-	3	1	1	-	-	4	2	5	1	-	[illegible]
[illegible]	-	-	-	-	-	1	-	-	1	-	-	-	-	-	1	-	-	1	-	-	-	[illegible]	[illegible]	[illegible]
[illegible]	-	-	2	-	-	-	-	-	-	1	5	-	-	-	1	-	-	-	-	-	-	[illegible]	-	[illegible]
M7	-	-	-	-	-	-	-	4	-	-	-	-	-	1	1	-	-	-	1	-	-	[illegible]	-	[illegible]
[illegible]	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	[illegible]
[illegible]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	[illegible]
M10	-	-	-	1	1	-	-	6	-	-	-	-	-	2	-	-	-	-	1	-	1	-	-	[illegible]
M11	-	1	1	1	1	-	-	-	1	1	-	-	-	-	22	-	-	-	4	2	-	-		[illegible]
M12	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	[illegible]
M13	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	[illegible]
B1	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	45	4	-	3	2	1	57
B2	-	1	-	-	1	-	-	-	-	1	-	-	-	3	-	1	1	4	56	2	7	3	1	[illegible]
B3	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	-	-	2	2	20	-	2	[illegible]	[illegible]
B4	-	-	-	-	-	-	-	2	-	[illegible]	-	-	-	-	4	-	-	2	2	3	22	2	1	[illegible]
B5	-	1	2	2	-	-	2	3	-	-	-	-	-	-	-	-	-	3	1	-	-	67	2	83
B6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	1	1	2	28	35
Total Types	3	10	13	12	14	9	4	37	4	9	7	1	1	11	35	3	1	57	79	30	39	84	35	498 Total Cases

TIME CORRELATION BASE DAY PLUS 1

BASE SECTOR IV CORRELATED AGAINST SELECTED SECTOR V

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	-	-	-	1	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	3
Z2	-	-	-	1	1	-	-	1	-	-	-	-	-	-	1	-	-	-	1	-	1	1	4	[illegible]
Z3	-	-	-	3	-	-	-	2	-	1	1	-	-	-	2	-	-	-	1	-	-	-	2	[illegible]
Z4	-	-	-	2	-	1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3	2	[illegible]
M1	-	-	-	-	-	-	-	1	-	3	-	-	-	-	-	-	2	1	1	-	2	3	1	[illegible]
M2	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-	4	-	1	-	-	-	-	[illegible]
M3	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	3
M4	-	1	-	1	3	3	1	1	-	2	-	-	-	-	1	-	9	1	3	-	2	6	[illegible]	[illegible]
M5	-	-	-	-	-	-	-	-	-	-	-	-	-	--	-	-	-	-	3	-	-	[illegible]	-	4
M6	1	-	-	2	-	-	-	1	-	2	-	-	-	-	-	-	1	-	-	-	-	1	1	9
M7	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	2	-	-	1	1	1	-	7
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
M10	-	-	-	1	-	1	-	-	-	1	-	-	-	-	-	-	3	1	1	-	-	1	3	12
M11	-	-	-	4	-	-	1	-	-	-	-	-	-	-	-	-	-	2	1	2	4	17	4	35
M12	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3
M13	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
B1	5	-	2	14	2	1	-	5	-	-	-	-	-	-	5	-	19	-	1	-	-	-	3	57
B2	-	-	1	12	1	-	2	6	-	1	-	-	-	-	8	-	38	-	-	-	-	5	7	81
B3	-	-	-	5	-	-	-	-	-	-	1	-	-	-	1	-	2	-	1	-	17	3	1	31
B4	1	1	-	3	-	6	1	1	-	1	-	-	-	-	-	1	15	-	2	-	1	4	2	39
B5	2	7	3	18	4	-	2	4	-	2	1	-	-	-	13	-	3	-	7	10	3	-	4	83
B6	-	-	-	7	3	-	-	-	-	4	-	-	-	-	3	5	11	-	-	1	1	-	-	35
Total Types	9	9	6	79	15	13	9	24	-	20	3	-	--	-	35	6	109	5	26	14	32	46	38	498 Total Cases

TIME CORRELATION BASE DAY PLUS 1

BASE SECTOR V CORRELATED AGAINST SELECTED SECTOR V

SELECTED SECTOR WEATHER TYPES

	Z1	Z2	Z3	Z4	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	B1	B2	B3	B4	B5	B6	Total Types
Z1	4	-	1	-	1	-	-	-	-	1	-	-	-	-	-	-	1	-	1	-	-	-	-	9
Z2	-	4	1	1	-	1	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	9
Z3	1	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	6
Z4	1	1	-	50	4	3	1	1	-	1	1	-	-	-	-	1	11	-	-	1	1	1	1	79
M1	-	-	-	-	6	4	-	1	-	1	-	-	-	-	2	-	1	-	-	-	-	-	-	15
M2	-	-	1	1	-	3	1	-	-	1	-	-	-	-	1	-	3	-	1	-	1	-	-	13
M3	1	1	-	-	-	-	3	-	-	1	-	-	-	-	1	-	1	-	-	-	-	-	-	8
M4	-	-	1	-	2	-	1	16	-	-	-	-	-	-	1	-	2	-	1	-	-	-	1	25
M5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--
M6	1	-	-	5	-	-	1	-	-	8	-	-	-	-	-	-	1	-	1	1	-	1	-	19
M7	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	1	-	-	-	-	-	-	3
M8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--
M9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--
M10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	-	-	-	-	-	-	-	--
M11	1	1	1	3	1	1	-	2	-	1	-	-	-	-	23	-	2	-	-	-	-	-	-	36
M12	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	1	1	-	6
M13	-	-	-	9	-	1	1	4	-	5	1	-	-	-	4	2	77	1	-	-	2	3	-	110
B1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	1	-	-	5
B2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	21	2	-	1	-	27
B3	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	9	1	-	2	14
B4	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	22	4	1	32
B5	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	2	35	4	45
B6	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	1	2	-	1	-	1	-	29	37
Total Types	9	9	6	79	15	13	9	24	-	20	3	-	-	-	35	6	109	5	26	14	32	46	38	498 Total Cases